



SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL
Sheringal, Dir Upper, Khyber Pakhtunkhwa,

Ref #

INVITATION FOR BIDS

Shaheed Benazir Bhutto University, Sheringal Dir Upper (Public Sector University), invites Sealed Bids from the eligible firm(s)/person(s) duly registered/licensed by the Pakistan Engineering Council (PEC), in Category C-4 or above, for the following works under the HEC, Govt. of Pakistan, PSDP funded Project “Development of University of Dir, Sheringal, Dir Upper”. A foreign bidder is entitled to the bid only in a joint venture with a Pakistani Constructor(s) in accordance with the relevant provisions of the PEC by-laws. Bidding is invited in accordance with PPRA Code/Rule 36(B) “**Single Stage-Two Envelope Bidding Procedure**” comprising of “**Technical Bids & Financial Bids**”.

Name of The Work (Contract Package)	Estimated Cost (PKR)	Bid Security (PKR)	Completion Time	Opening Date
1). Construction of “Central Library”	Rs. 72.750 Million	2 % of the Quoted Cost	12 Months	16.07.2019
2). Construction of “Multi-purposed Hall”	Rs. 65.153 Million	2 % of the Quoted Cost	10 Months	18.07.2019

Terms & Conditions:

1. A complete set of Bidding Documents (Volume I, II, III & IV) may be downloaded free of cost from the University official website www.sbbu.edu.pk
2. The eligible constructors/companies/firms are required to submit Tender/bid documents as per following guidelines:
 - Both “Technical Bids” and “Priced/Financial Bids” shall be submitted in two separate sealed inner envelopes marked “**1-Technical Bid**” and “**2-Financial/Priced Bid (Volume-III)**” which shall be packed in one outer envelope.
 - Interested firms/bidders are required to furnish, duly signed and stamped each page (by the bidder or the authorized representative) of Volumes I, II, & IV binded along with the company/firm brochure, having Qualification Documents/information as per guidelines of Volume – I, as parts of Technical Bid.
 - The Bid Security shall be enclosed with “Financial Bid” however the bidder shall ensure, in writing in the Technical Bid, that 2% Bid Security of the Quoted Cost is attached in financial/priced bid.
3. Financial Bids” of Technically Qualified responsive bidders shall be opened on a suitable date(s), fixed by the Bid Opening & Evaluation Committee, while the Priced Bids of Unqualified bidders will be returned unopened.
4. Bidder shall quote premium or rebate in %ages both on MRS and Non MRS of BOQ items.

5. The bidder who quote more than 10% below on the estimated cost, shall submit 8% additional performance security as per instructions to bidders.
6. Incomplete/disfiguring/over-writing by hand/delayed bids will be considered non responsive.
7. The bidders are at liberty to seek any clarification or further information, if any, from the office of the undersigned on any working day before days of closing date of the bid.
8. Conditional, incomplete, unsigned, filled with lead pencil bids shall be considered as non-responsive.
9. Sealed Bids must be accompanied by a Bid Security, as mentioned above in the form of Call Deposit Receipt (CDR)/Pay Order/Bank Draft from the Scheduled Bank of Pakistan in the name of Treasurer, Shaheed Benazir Bhutto University, Sheringal.
10. **The bids, complete in all respects, must reach on or before 11.00 AM of the above mentioned dates, to the office of the Accounts Officer (Project), Project Management Unit, Shaheed Benazir Bhutto University, Sheringal Dir Upper.** Bids shall be opened at 11:30 AM of the same days (last dates) in the presence of Bidders' or their authorized representative (s), who chose to attend.

Project Director

Shaheed Benazir Bhutto University, Sheringal, Dir Upper
Ph. No. 0944 – 885402/885406, Fax No. 0944- 885805

SHAHEED BENAZIR BHUTTO UNIVERSITY SHERINGAL DIR UPPER KHYBER PAKHTUNKHWA PAKISTAN.

- **BUILDING ITEM:-** CONSTRUCTION OF MULTIPURPOSE HALL.
- **PROJECT NAME:-** DEVELOPMENT OF UNIVERSITY OF DIR SHERINGAL.
- **SPONSORING AGENCY:** HIGHER EDUCATION COMMISSION ISLAMABAD.
- **FUNDING AGENCY:** PLANNING COMMISSION, GOP.

BIDDING DOCUMENTS

Volume-I



ASSOCIATED CONSULTING ENGINEERS – ACE (PVT) LTD
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**Project Director/
Director Works/
Director P& Development,
Shaheed Benazir Bhutto
University
Sheringal Dir Upper**



ISO 9001 Certified

Seal and Signature of Bidder M/S_____

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Seal and Signature of Bidder M/S_____

INSTRUCTIONS TO BIDDERS (ITB)

(Note: These Instructions to Bidders along with **Bidding Data (BD)** will not be part of the Contract and will cease to have effect once the contract is signed.)

A. GENERAL

ITB.1 Scope of Bid

- 1.1 The Employer as defined in the **Bidding Data** hereinafter called “the Employer” wishes to receive bids for the construction and completion of works as described in these Bidding Documents, and summarized in the **Bidding Data** hereinafter referred to as the “Works”.
- 1.2 The successful bidder will be expected to complete the Works within the time specified in Appendix-A to Bid.

ITB.2 Source of Funds

- 2.1 The Employer has applied for/received a loan/credit from the source (s) indicated in the **Bidding Data** in various currencies towards the cost of the project specified in the **Bidding Data** and it is intended that part of the proceeds of this loan/credit will be applied to eligible payments under the Contract for which these Bidding Documents are issued.

ITB.3 Eligible Bidders

- 3.1 This Invitation for Bids is open to all bidders meeting the following requirements:
 - a. Duly licensed by the Pakistan Engineering Council (PEC) in the category relevant to the value of the Works.
 - b. Duly prequalified / enlisted with the Employer.

ITB.4 One Bid per Bidder

- 4.1 Each bidder shall submit only one bid either by himself, or as a partner in a joint venture. A bidder who submits or participates in more than one bid (other than alternatives pursuant to Clause ITB.16) will be disqualified.

ITB.5 Cost of Bidding

- 5.1 The bidders shall bear all costs associated with the preparation and submission of their respective bids and the Employer will in no case be responsible or liable for those costs, regardless of the conduct or outcome of the bidding process.

ITB.6 Site Visit

- 6.1 The bidders are advised to visit and examine the Site of Works and its surroundings and obtain for themselves on their own responsibility all information that may be necessary for preparing the bid and entering into a contract for construction of the Works. All cost in this respect shall be at the bidder's own expense.
- 6.2 The bidders and any of their personnel or agents will be granted permission by the Employer to enter upon his premises and lands for the purpose of such inspection, but only upon the express condition that the bidders, their personnel and agents, will release and indemnify the Employer, his personnel and agents from and against all liability in respect thereof and will be responsible for death or personal injury, loss of or damage to property and any other loss, damage, costs and expenses incurred as a result of such inspection.

Seal and Signature of Bidder M/S_____

B. BIDDING DOCUMENTS

ITB.7 Contents of Bidding Documents

- 7.1 The Bidding Documents, in addition to invitation for bids, are those stated below and should be read in conjunction with any Addenda issued in accordance with Clause ITB.9.
1. Instructions to Bidders.
 2. Bidding Data.
 3. General Conditions of Contract, Part-I (GCC).
 4. Particular Conditions of Contract, Part-II (PCC).
 5. Specifications – Special Provisions.
 6. Specifications - Technical Provisions.
 7. Form of Bid & Appendices to Bid.
 8. Bill of Quantities (Appendix-D to Bid).
 9. Form of Bid Security.
 10. Form of Contract Agreement.
 11. Forms of Performance Security and Mobilization Advance Guarantee/Bond.
 12. Drawings.
- 7.2 The bidders are expected to examine carefully the contents of all the above documents. Failure to comply with the requirements of bid submission will be at the Bidder's own risk. Pursuant to Clause ITB.26, bids which are not substantially responsive to the requirements of the Bidding Documents will be rejected.

ITB.8 Clarification of Bidding Documents

- 8.1 Any prospective bidder requiring any clarification (s) in respect of the Bidding Documents may notify the Employer in writing at the Employer's address indicated in the Invitation for Bids. The Employer will respond to any request for clarification which he receives earlier than 28 days prior to the deadline for submission of bids. Copies of the Employer's response will be forwarded to all purchasers of the Bidding Documents, including a description of the enquiry but without identifying its source.

ITB.9 Amendment of Bidding Documents

- 9.1 At any time prior to the deadline for submission of bids, the Employer may, for any reason, whether at his own initiative or in response to a clarification requested by a prospective bidder, modify the Bidding Documents by issuing addendum.
- 9.2 Any addendum thus issued shall be part of the Bidding Documents pursuant to Sub--Clause 7.1 hereof and shall be communicated in writing to all purchasers of the Bidding Documents. Prospective bidders shall acknowledge receipt of each addendum in writing to the Employer.
- 9.3 To afford prospective bidders reasonable time in which to take an addendum into account in preparing their bids, the Employer may extend the deadline for submission of bids in accordance with Clause ITB.20

C. PREPARATION OF BIDS

ITB.10 Language of Bid

- 10.1 The bid and all correspondence and documents related to the bid exchanged by a bidder and the Employer shall be in the bid language stipulated in the **Bidding Data** and Particular Conditions of Contract. Supporting documents and printed literature furnished by the bidders may be in any other language provided the same are accompanied by an accurate translation of the relevant parts in the bid language, in which case, for purposes of evaluation of the bid, the translation in bid language shall prevail.

Seal and Signature of Bidder M/S_____

ITB.11 Documents Accompanying the Bid

11.1 Each bidder shall:

- (a) Submit a written power of attorney authorizing the signatory of the bid to act for and on behalf of the bidder;
- (b) Update the information indicated and listed in the **Bidding Data** and previously submitted with the application for prequalification, and continue to meet the minimum criteria set out in the prequalification documents which as a minimum, would include the following :
 - (i) Evidence of access to financial resources along with average annual construction turnover;
 - (ii) Financial predictions for the current year and the two following years including the effect of known commitments;
 - (iii) Work commitments since prequalification;
 - (iv) Current litigation information; and
 - (v) Availability of critical equipment.

and

- (c) Furnish a technical proposal taking into account the various Appendices to Bid specially the following:

Appendix-E to Bid	Proposed Construction Schedule
Appendix-F to Bid	Method of Performing the Work
Appendix-G to Bid	List of Major Equipment
Appendix-K to Bid	Organization Chart for Supervisory Staff

and other pertinent information such as mobilization programme etc;

11.2 Bids submitted by a joint venture of two (2) or more firms shall comply with the following requirements:

- (a) the bid and in case of a successful bid, the Form of Contract Agreement shall be signed so as to be legally binding on all partners;
- (b) one of the joint venture partners shall be nominated as being in charge; and this authorization shall be evidenced by submitting a power of attorney signed by legally authorized signatories of all the joint venture partners;
- (c) the partner-in-charge shall always be duly authorized to deal with the Employer regarding all matters related with and/or incidental to the execution of Works as per the terms and Conditions of Contract and in this regard to incur any and all liabilities, receive instructions, give binding undertakings and receive payments on behalf of the joint venture;
- (d) all partners of the joint venture shall at all times and under all circumstances be liable jointly and severally for the execution of the Contract in accordance with the Contract terms and a statement to this effect shall be included in the authorization mentioned under Sub-Para(b) above as well as in the Form of Bid and in the Form of Contract Agreement (in case of a successful bid); and
- (e) a copy of the agreement entered into by the joint venture partners shall be submitted with the bid stating the conditions under which it will function, its period of duration, the persons authorized to represent and obligate it and which persons will be directly

Seal and Signature of Bidder M/S_____

responsible for due performance of the Contract and can give valid receipts on behalf of the joint venture, the proportionate participation of the several firms forming the joint venture, and any other information necessary to permit a full appraisal of its functioning. No amendments / modifications whatsoever in the joint venture agreement shall be agreed to between the joint venture partner without prior written consent of the Employer.

- 11.3 Bidders shall also submit proposals of work methods and schedule, in sufficient detail to demonstrate the adequacy of the Bidders' proposals to meet the technical specifications and the completion time referred to in Sub-Clause 1.2 hereof.

ITB.12 Bid Prices

- 12.1 Unless stated otherwise in the Bidding Documents, the Contract shall be for the whole of the Works as described in Sub-Clause 1.1 hereof, based on the unit rates and / or prices submitted by the bidder.
- 12.2 The bidders shall fill in rates and prices for all items of the Works described in the Bill of Quantities. Items against which no rate or price is entered by a bidder will not be paid for by the Employer when executed and shall be deemed covered by rates and prices for other items in the Bill of Quantities.
- 12.3 All duties, taxes and other levies payable by the Contractor under the Contract, or for any other cause, as on the date 28 days prior to the deadline for submission of bids shall be included in the rates and prices and the total Bid Price submitted by a bidder.

Additional / reduced duties, taxes and levies due to subsequent additions or changes in legislation shall be reimbursed / deducted as per Sub-Clause 70.2 of the General Conditions of Contract Part-I.

- 12.4 The rates and prices quoted by the bidders are subject to adjustment during the performance of the Contract in accordance with the provisions of Clause 70 of the Conditions of Contract. The bidders shall furnish the prescribed information for the price adjustment formulae in Appendix-C to Bid, and shall submit with their bids such other supporting information as required under the said Clause.

ITB.13 Currencies of Bid and Payment

- 13.1 The unit rates and the prices shall be quoted by the bidder entirely in Pak rupees. A bidder expecting to incur expenditures in other currencies for inputs to the Works supplied from outside the Employer's country (referred to as the "Foreign Currency Requirements") shall indicate the same in Appendix-B to Bid. The proportion of the Bid Price (excluding Provisional Sums) needed by him for the payment of such Foreign Currency Requirements either (i) entirely in the currency of the Bidder's home country or, (ii) at the bidder's option, entirely in Pak rupees provided always that a bidder expecting to incur expenditures in a currency or currencies other than those stated in (i) and (ii) above for a portion of the foreign currency requirements, and wishing to be paid accordingly, shall indicate the respective portions in his bid.
- 13.2 The rates of exchange to be used by the bidder for currency conversion shall be the TT&OD Selling Rates published or authorized by the State Bank of Pakistan prevailing on the date 28 days prior to the deadline for submission of bids.

For the purpose of payments, the exchange rates used in bid preparation shall apply for the duration of the Contract.

Seal and Signature of Bidder M/S_____

ITB.14 Bid Validity

- 14.1 Bids shall remain valid for the period stipulated in the **Bidding Data** after the Date of Bid Opening specified in Clause ITB.23.
- 14.2 In exceptional circumstances, prior to expiry of the original bid validity period, the Employer may request that the bidders extend the period of validity for a specified additional period which shall in no case be more than the original bid validity period. The request and the responses thereto shall be made in writing. A bidder may refuse the request without forfeiting his Bid Security. A bidder agreeing to the request will not be required or permitted to modify his bid, but will be required to extend the validity of his Bid Security for the period of the extension, and in compliance with Clause ITB.15 in all respects.

ITB.15 Bid Security

- 15.1 Each bidder shall furnish, as part of his bid, a Bid Security in the amount stipulated in the **Bidding Data** in Pak Rupees or an equivalent amount in a freely convertible currency.
- 15.2 The Bid Security shall be, at the option of the bidder, in the form of Deposit at Call or a Bank Guarantee issued by a Scheduled Bank in Pakistan or from a foreign bank duly counter guaranteed by a Scheduled Bank in Pakistan or an insurance company having atleast AA rating from PACRA/JCR in favour of the Employer valid for a period 28 days beyond the Bid Validity date.
- 15.3 Any bid not accompanied by an acceptable Bid Security shall be rejected by the Employer as non-responsive.
- 15.4 The bid securities of unsuccessful bidders will be returned as promptly as possible, but not later than 28 days after the expiration of the period of Bid Validity.
- 15.5 The Bid Security of the successful bidder will be returned when the bidder has furnished the required Performance Security and signed the Contract Agreement.
- 15.6 The Bid Security may be forfeited:
 - (a) If the bidder withdraws his bid except as provided in Sub-Clause 22.1;
 - (b) If the bidder does not accept the correction of his Bid Price pursuant to Sub-Clause 27.2 hereof; or
 - (c) In the case of successful bidder, if he fails within the specified time limit to:
 - (i) Furnish the required Performance Security; or
 - (ii) Sign the Contract Agreement.

ITB.16 Alternate Proposals by Bidder

- 16.1 Should any bidder consider that he can offer any advantages to the Employer by a modification to the designs, specifications or other conditions, he may, in addition to his bid to be submitted in strict compliance with the Bidding Documents, submit any Alternate Proposal(s) containing (a) relevant design calculations; (b) technical specifications; (c) proposed construction methodology; and (d) any other relevant details / conditions, provided always that the total sum entered on the Form of Bid shall be that which represents complete compliance with the Bidding Documents.
- 16.2 Alternate Proposal(s), if any, of the lowest evaluated responsive bidder only may be considered by the Employer as the basis for the award of Contract to such bidder.

Seal and Signature of Bidder M/S_____

ITB.17 Pre-Bid Meeting

- 17.1 The Employer may, on his own motion or at the request of any prospective bidder(s), hold a pre-bid meeting to clarify issues and to answer any questions on matters related to the Bidding Documents. The date, time and venue of pre-bid meeting, if convened, is as stipulated in the **Bidding Data**. All prospective bidders or their authorized representatives shall be invited to attend such a pre-bid meeting.
- 17.2 The bidders are requested to submit questions, if any, in writing so as to reach the Employer not later than seven (7) days before the proposed pre-bid meeting.
- 17.3 Minutes of the pre-bid meeting, including the text of the questions raised and the replies given, will be transmitted without delay to all purchasers of the Bidding Documents. Any modification of the Bidding Documents listed in Sub-Clause 7.1 hereof which may become necessary as a result of the pre-bid meeting shall be made by the Employer exclusively through the issue of an Addendum pursuant to Clause ITB.9 and not through the minutes of the pre-bid meeting.
- 17.4 Absence at the pre-bid meeting will not be a cause for disqualification of a bidder.

ITB.18 Format and Signing of Bid

- 18.1 Bidders are particularly directed that the amount entered on the Form of Bid shall be for performing the Contract strictly in accordance with the Bidding Documents.
- 18.2 All appendices to Bid are to be properly completed and signed.
- 18.3 No alteration is to be made in the Form of Bid nor in the Appendices thereto except in filling up the blanks as directed. If any such alterations be made or if these instructions be not fully complied with, the bid may be rejected.
- 18.4 Each bidder shall prepare by filling out the forms completely and without alterations one (1) original and number of copies, specified in the **Bidding Data**, of the documents comprising the bid as described in Clause ITB.7 and clearly mark them "ORIGINAL" and "COPY" as appropriate. In the event of discrepancy between them, the original shall prevail.
- 18.5 The original and all copies of the bid shall be typed or written in indelible ink (in the case of copies, Photostats are also acceptable) and shall be signed by a person or persons duly authorized to sign on behalf of the bidder pursuant to Sub-Clause 11.1(a) hereof. All pages of the bid shall be initialed and stamped by the person or persons signing the bid.
- 18.6 The bid shall contain no alterations, omissions or additions, except to comply with instructions issued by the Employer, or as are necessary to correct errors made by the bidder, in which case such corrections shall be initialed by the person or persons signing the bid.
- 18.7 Bidders shall indicate in the space provided in the Form of Bid their full and proper addresses at which notices may be legally served on them and to which all correspondence in connection with their bids and the Contract is to be sent.
- 18.8 Bidders should retain a copy of the Bidding Documents as their file copy.

Seal and Signature of Bidder M/S_____

D. SUBMISSION OF BIDS

ITB.19 Sealing and Marking of Bids

- 19.1 Each bidder shall submit his bid as under:
- (a) ORIGINAL and each copy of the Bid shall be separately sealed and put in separate envelopes and marked as such.
 - (b) The envelopes containing the ORIGINAL and copies will be put in one sealed envelope and addressed / identified as given in Sub- Clause 19.2 hereof.
- 19.2 The inner and outer envelopes shall:
- (a) be addressed to the Employer at the address provided in the **Bidding Data**;
 - (b) bear the name and identification number of the contract as defined in the **Bidding Data**; and
 - (c) provide a warning not to open before the time and date for bid opening, as specified in the **Bidding Data**.
- 19.3 In addition to the identification required in Sub- Clause 19.2 hereof, the inner envelope shall indicate the name and address of the bidder to enable the bid to be returned unopened in case it is declared "late" pursuant to Clause ITB.21
- 19.4 If the outer envelope is not sealed and marked as above, the Employer will assume no responsibility for the misplacement or premature opening of the Bid.

ITB.20 Deadline for Submission of Bids

- 20.1
- (a) Bids must be received by the Employer at the address specified no later than the time and date stipulated in the **Bidding Data**.
 - (b) Bids with charges payable will not be accepted, nor will arrangements be undertaken to collect the bids from any delivery point other than that specified above. Bidders shall bear all expenses incurred in the preparation and delivery of bids. No claims will be entertained for refund of such expenses.
 - (c) Where delivery of a bid is by mail and the bidder wishes to receive an acknowledgment of receipt of such bid, he shall make a request for such acknowledgment in a separate letter attached to but not included in the sealed bid package.
 - (d) Upon request, acknowledgment of receipt of bids will be provided to those making delivery in person or by messenger.
- 20.2 The Employer may, at his discretion, extend the deadline for submission of bids by issuing an amendment in accordance with Clause ITB.9, in which case all rights and obligations of the Employer and the bidders previously subject to the original deadline will thereafter be subject to the deadline as extended.

ITB.21 Late Bids

- 21.1
- (a) Any bid received by the Employer after the deadline for submission of bids prescribed in Clause ITB.20 will be returned unopened to such bidder.

Seal and Signature of Bidder M/S_____

- (b) Delays in the mail, delays of person in transit, or delivery of a bid to the wrong office shall not be accepted as an excuse for failure to deliver a bid at the proper place and time. It shall be the bidder's responsibility to determine the manner in which timely delivery of his bid will be accomplished either in person, by messenger or by mail.

ITB.22 Modification, Substitution and Withdrawal of Bids

- 22.1 Any bidder may modify, substitute or withdraw his bid after bid submission provided that the modification, substitution or written notice of withdrawal is received by the Employer prior to the deadline for submission of bids.
- 22.2 The modification, substitution, or notice for withdrawal of any bid shall be prepared, sealed, marked and delivered in accordance with the provisions of Clause ITB.19 with the outer and inner envelopes additionally marked "MODIFICATION", "SUBSTITUTION" or "WITHDRAWAL" as appropriate.
- 22.3 No bid may be modified by a bidder after the deadline for submission of bids except in accordance with Sub-Clauses 22.1 and 27.2.
- 22.4 Withdrawal of a bid during the interval between the deadline for submission of bids and the expiration of the period of bid validity specified in the Form of Bid may result in forfeiture of the Bid Security in pursuance to Clause ITB.15.

E. BID OPENING AND EVALUATION

ITB.23 Bid Opening

- 23.1 The Employer will open the bids, including withdrawals, substitution and modifications made pursuant to Clause ITB.22, in the presence of bidders' representatives who choose to attend, at the time, date and location stipulated in the **Bidding Data**. The bidders' representatives who are present shall sign a register evidencing their attendance.
- 23.2 Envelopes marked "MODIFICATION", "SUBSTITUTION" or "WITHDRAWAL" shall be opened and read out first. Bids for which an acceptable notice of withdrawal has been submitted pursuant to Clause ITB.22 shall not be opened.
- 23.3 The bidder's name, total Bid Price and price of any Alternate Proposal(s), any discounts, bid modifications, substitution and withdrawals, the presence or absence of Bid Security, and such other details as the Employer may consider appropriate, will be announced by the Employer at the opening of bids.
- 23.4 Employer shall prepare minutes of the bid opening, including the information disclosed to those present in accordance with the Sub-Clause 23.3.

ITB.24 Process to be Confidential

- 24.1 Information relating to the examination, clarification, evaluation and comparison of bid and recommendations for the award of a contract shall not be disclosed to bidders or any other person not officially concerned with such process before the announcement of bid evaluation report which shall be done at least ten (10) days prior to issue of Letter of Acceptance. The announcement to all Bidders will include table(s) comprising read out prices, discounted prices, price adjustments made, final evaluated prices and recommendations against all the bids evaluated. Any effort by a bidder to influence the Employer's processing of bids or award decisions may result in the rejection of such bidder's bid. Whereas any bidder feeling aggrieved may lodge a written complaint not later than fifteen (15) days after the announcement of the bid evaluation report; however mere fact of lodging a complaint shall not warrant suspension of the procurement process.

Seal and Signature of Bidder M/S_____

ITB.25 Clarification of Bids

- 25.1 To assist in the examination, evaluation and comparison of bids, the Employer may, at his discretion, ask any bidder for clarification of his bid, including breakdowns of unit rates. The request for clarification and the response shall be in writing but no change in the price or substance of the bid shall be sought, offered or permitted except as required to confirm the correction of arithmetic errors discovered by the Employer in the evaluation of the bids in accordance with Clause ITB.28.

ITB.26 Examination of Bids and Determination of Responsiveness

- 26.1 Prior to the detailed evaluation of bids, the Employer will determine whether each bid is substantially responsive to the requirements of the Bidding Documents.
- 26.2 A substantially responsive bid is one which;
- i. Meets the eligibility criteria;
 - ii. has been properly signed;
 - iii. is accompanied by the required Bid Security; and
 - iv. conforms to all the terms, conditions and specifications of the Bidding Documents, without material deviation or reservation.

A material deviation or reservation is one;

- i. which affect in any substantial way the scope, quality or performance of the Works;
 - ii. which limits in any substantial way, inconsistent with the Bidding Documents, the Employer's rights or the bidder's obligations under the Contract; or
 - iii. adoption/ rectification whereof would affect unfairly the competitive position of other bidders presenting substantially responsive bids.
- 26.3 If a bid is not substantially responsive, it will be rejected by the Employer, and may not subsequently be made responsive by correction or withdrawal of the non-conforming deviation or reservation.

ITB.27 Correction of Errors

- 27.1 Bids determined to be substantially responsive will be checked by the Employer for any arithmetic errors. Errors will be corrected by the Employer as follows:
- (a) where there is a discrepancy between the amounts in figures and in words, the amount in words will govern; and
 - (b) where there is a discrepancy between the unit rate and the line item total resulting from multiplying the unit rate by the quantity, the unit rate as quoted will govern, unless in the opinion of the Employer there is an obviously gross misplacement of the decimal point in the unit rate, in which case the line item total as quoted will govern and the unit rate will be corrected.
- 27.2 The amount stated in the Form of Bid will be adjusted by the Employer in accordance with the above procedure for the correction of errors and with the concurrence of the bidder, shall be considered as binding upon the bidder. If the bidder does not accept the corrected Bid Price, his Bid will be rejected, and the Bid Security shall be forfeited in accordance with Sub- Clause 15.6(b) hereof.

ITB.28 Evaluation and Comparison of Bids

- 28.1 The Employer will evaluate and compare only the Bids determined to be substantially responsive in accordance with Clause ITB.26.

Seal and Signature of Bidder M/S_____

- 28.2 In evaluating the Bids, the Employer will determine for each Bid the evaluated Bid Price by adjusting the Bid Price as follows:
- (a) making any correction for errors pursuant to Clause ITB.27;
 - (b) excluding Provisional Sums and the provision, if any, for contingencies in the Summary Bill of Quantities, but including competitively priced Daywork; and
 - (c) making an appropriate adjustment for any other acceptable variation or deviation.
- 28.3 The estimated effect of the price adjustment provisions of the Conditions of Contract, applied over the period of execution of the Contract, shall not be taken into account in Bid evaluation.
- 28.4 If the Bid of the successful bidder is seriously unbalanced in relation to the Employer's estimate of the cost of work to be performed under the Contract, the Employer may require the bidder to produce detailed price analyses for any or all items of the Bill of Quantities to demonstrate the internal consistency of those prices with the construction methods and schedule proposed. After evaluation of the price analyses, the Employer may require that the amount of the Performance Security set forth in Clause ITB.32 be increased at the expense of the successful bidder to a level sufficient to protect the Employer against financial loss in the event of default of the successful bidder under the Contract.

F. AWARD OF CONTRACT

ITB.29 Award

- 29.1 Subject to Clauses ITB.30 and ITB.34, the Employer will award the Contract to the bidder whose bid has been determined to be substantially responsive to the Bidding Documents and who has offered the lowest evaluated Bid Price, provided that such bidder has been determined to be eligible in accordance with the provisions of Clause ITB.3 and qualify pursuant to Sub-Clause ITB 29.2.
- 29.2 The Employer, at any stage of the bid evaluation, having credible reasons for or *prima facie* evidence of any defect in supplier's or contractor's capacities, may require the suppliers or contractors to provide information concerning their professional, technical, financial, legal or managerial competence whether already pre-qualified or not:

Provided that such qualification shall only be laid down after recording reasons therefor in writing. They shall form part of the records of that bid evaluation report.

ITB.30 Employer's Right to Accept any Bid and to Reject any or all Bids

- 30.1 Notwithstanding Clause ITB.29, the Employer reserves the right to accept or reject any Bid, and to annul the bidding process and reject all bids, at any time prior to award of Contract, without thereby incurring any liability to the affected bidders or any obligation except that the grounds for rejection of all bids shall upon request be communicated to any bidder who submitted a bid, without justification of grounds. Rejection of all bids shall be notified to all bidders promptly.

ITB.31 Notification of Award

- 31.1 Prior to expiration of the period of bid validity prescribed by the Employer, the Employer will notify the successful bidder in writing ("Letter of Acceptance") that his Bid has been accepted. This letter shall name the sum which the Employer will pay the Contractor in consideration of the execution and completion of the Works by the Contractor as prescribed by the Contract (hereinafter and in the Conditions of Contract called the "Contract Price").

Seal and Signature of Bidder M/S_____

- 31.2 No Negotiation with the bidder having evaluated as lowest responsive or any other bidder shall be permitted, however, Employer may have clarification meetings to get clarify any item in the bid evaluation report.
- 31.3 The notification of award and its acceptance by the bidder will constitute the formation of the Contract, binding the Employer and the bidder till signing of the formal Contract Agreement.
- 31.3 Upon furnishing by the successful bidder of a Performance Security, the Employer will promptly notify the other bidders that their Bids have been unsuccessful and return their bid securities.

ITB.32 Performance Security

- 32.1 The successful bidder shall furnish to the Employer a Performance Security in the form and the amount stipulated in the **Bidding Data** and the Conditions of Contract within a period of 28 days after the receipt of Letter of Acceptance.
- 32.2 Failure of the successful bidder to comply with the requirements of Sub-Clause ITB.32.1 or Clauses ITB.33 or ITB.35 shall constitute sufficient grounds for the annulment of the award and forfeiture of the Bid Security.

ITB.33 Signing of Contract Agreement

- 33.1 Within 14 days from the date of furnishing of acceptable Performance Security under the Conditions of Contract, the Employer will send the successful bidder the Contract Agreement in the form provided in the Bidding Documents, incorporating all agreements between the parties.
- 33.2 The formal Agreement between the Employer and the successful bidder shall be executed within 14 days of the receipt of the Contract Agreement by the successful bidder from the Employer.

ITB.34 General Performance of the Bidders

The Employer reserves the right to obtain information regarding performance of the bidders on their previously awarded contracts/works. The Employer may in case of consistent poor performance of any Bidder as reported by the employers of the previously awarded contracts, interalia, reject his bid and/or refer the case to the Pakistan Engineering Council (PEC). Upon such reference, PEC in accordance with its rules, procedures and relevant laws of the land take such action as may be deemed appropriate under the circumstances of the case including black listing of such Bidder and debarring him from participation in future bidding for similar works.

ITB.35 Integrity Pact

The Bidder shall sign and stamp the Integrity Pact provided at Appendix-L to Bid in the Bidding Documents for all Federal Government procurement contracts exceeding Rupees ten million. Failure to provide such Integrity Pact shall make the bidder non-responsive.

ITB.36 Instructions not Part of Contract

Bids shall be prepared and submitted in accordance with these Instructions which are provided to assist bidders in preparing their bids, and do not constitute part of the Bid or the Contract Documents.

Seal and Signature of Bidder M/S_____

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Seal and Signature of Bidder M/S_____

BIDDING DATA (BD)

The following specific data for the Works to be bided shall complement, amend, or supplement the provisions in the Instructions to Bidders (**ITB**). Wherever there is a conflict, the provisions herein shall prevail over those in the Instructions to Bidders (**ITB**).

BD.1 Scope of Bid

1.1 Name and address of the Employer:

The Vice Chancellor
Shaheed Benazir Bhutto University
Sheringal, Dir Upper

1.2 Name of the Project/Work:

“Construction of Multipurpose Hall” at Shaheed Benazir Bhutto University, Sheringal Dir Upper

BD.2 Source of Funds:

- 2.1** *PC-1 of the project has been approved by Govt. of Pakistan and shall allocate funds under its annual PSDP. The employer used to receive funds from HEC Govt. of Pakistan.*

BD.3 Eligible Bidders

- 3.1.a** *Duly licensed as constructor by the Pakistan Engineering Council (PEC), in Category C-4 or above.*
- 3.1.b** *Meet the qualification criteria as mentioned in **ITB/BD**.*

BD.4 One Bid per Bidder

Add the following at the end;

Bidders are allowed to participate in two or more bids invited by the Employer for other works to be opened on same day.

BD.6 Site Visit

The following sub-clauses are added;

- 6.3** *The Bidder or his authorized representative shall visit & inspect the Site of the Works including the areas & surroundings to be used for Contractor's Camp, on his own responsibility & at his own expense, & obtain all the information from his own sources, which may be necessary for preparing the Bid. The Employer may assist but will not take any responsibility for the supply or correctness of the information.*
- 6.4** *The Bidder shall, before submitting his Bid, satisfy himself in all respects including the following:-*
- I. The existing facilities in the vicinity of the Site of Work, the hydrological & climatologically conditions, the form & the nature of the Site of Work.*
 - II. The quantities & nature of the work & materials necessary for completion of the Works.*
 - III. The means of access to the Site of the Work & exit from the Site.*
 - IV. The available accommodation on land for Contractor's Camp within or outside the Site of Work.*
 - V. All necessary information as to risks, contingencies & other circumstances which may influence or affect the bid.*
 - VI. The type & nature of soil existing in area of work & the existing conditions of Site.*

Seal and Signature of Bidder M/S_____

- 6.5 *Each Bidder shall also enquire & satisfy himself as to the source, the quantity of supply, sufficiency of & the means of obtaining & transporting all plant, material, labor, fuel, water, electricity & other matters or things required for in connection with the works.*
- 6.6 *In preparing the bid, bidders shall also consider his obligation to adequately store all materials & maintain existing facilities & all temporary works during the period of their usage.*
- 6.7 *The Bidder must make local inquiries as to the physical conditions prevailing at the Site & obtain his own information on all matters & things that may in any way influence him in making a Bid & fixing the rates in the Bill of Quantities. He must also satisfy himself as to the risks, obligations & responsibilities to be undertaken in accordance to the Contract to be entered into by him should his Bid be accepted.*
- 6.8 *The Bidder shall make his own investigations, enquiries & assessments, on all matters, of all conditions of existing constructions at the site & its vicinity to his satisfaction before submitting his Bid.*

BD.7 Contents of Bidding Documents

- 7.1 *The Bidding Documents, in addition to invitation for Bids (NIT), are those stated below and should be read in conjunction with any Addenda issued in accordance with Clause ITB.9.*

7.1.1 Volume-I (Separate Volume)

1. *Instructions to Bidders (ITB).*
2. *Bidding Data (BD).*
3. *General Conditions of Contract, Part-I (GCC).*
4. *Particular Conditions of Contract, Part-II (PCC).*
5. *Specifications – Special Provisions.*
6. *Form of Bid & Appendices to Bid.*
7. *Form of Bid Security.*
8. *Format of Contract Agreement, Integrity Pact, etc.*
9. *Forms of Performance Security, Secured Advance Guarantee/Indemnity Bond etc.*

7.1.2 Volume-II (Separate Volume)

10. *Specifications - Technical Provisions.*

7.1.3 Volume-III (Separate Volume)

11. *Bill of Quantities/ Priced Bid alongwith preamble.*

7.1.4 Volume-IV (Separate Volume)

12. *Drawings.*

Bidding documents shall contain 02 Two Envelopes as;

7.1.a Envelop-1 (Technical Bid/Proposal)

Shall contain all documents mentioned in clause 11;

7.1.b Envelop-2 (Priced Bid/Financial Proposal)

Bidding documents shall contain Priced Bid i.e. Volume-III (Priced BOQ along with Preamble), (Attach Bid Security i.e. CDR etc.), letter of transmittal etc.

Seal and Signature of Bidder M/S_____

BD.8 Clarification of Bidding Document:

Regarding 2nd paragraph about response by the employer the read BD.9 as below.

BD.9 Amendment of bid documents:

Refer to BD-8 and BD0-9 the following is added;

Clarification and amendment of bid documents, if any, shall be uploaded on the official website of the Shaheed Benazir Bhutto University, Sheringal. Bidders are required to review university website one day prior to last date of submission of bid for the said purpose.

BD.10 Language of Bid:

10.1 *All communication relating to bid shall be in English Language.*

BD.11 Documents Accompanying the Bid:

11.1 *Bidding shall be "Single Stage Two Envelops Procedure, PPRA Rules 26(B), hence Envelop-I shall contain Qualification Documents and Envelop-II shall contain Financial Bid as; Bid Security shall be enclosed with Envelop-II.*

(A) Qualification Documents (Technical Bid/Proposal) shall comprise;

- i. Company profile (showing origin, head office, branches, vision, mission, management, directors, personals, and other necessary information);*
- ii. Registration Profile of the firm i.e., proprietorship or partnership or limited company with complete details of Owners/Partners, etc.*
- iii. Name & qualifications of senior management and technical personnel in the bidders organization;*
- iv. Name & qualifications of key personnel proposed to be assigned by the bidder for executions of the Project;*
- v. Valid Registration Certificate as Constructor with PEC in Category C-4 or above.*
- vi. Written power of attorney by the signatory of the bid authorizing the representative to act for and on behalf of the Bidder as per format provided in the bidding documents.*
- vii. Evidence of access to financial resources, availability of Bank Credit line etc.*
- viii. Banker Certificate & accounts Statements (last 03 Financial Years, upto i.e. 2017, 2016 & 2015):*
- ix. Updated financial statements for last 03 Financial Years.*
- x. Experience regarding works on hand and previous contracts with Complication Certificates.*
- xi. Personnel, Financial and Equipment capability;*
- xii. Status of enlistment with other Govt. Organizations;*
- xiii. Joint Venture (JV) Agreement complying with the instructions as per Clause ITB-11.2 duly registered with the Court of Law. Individual JV members shall also submit all documents as per requirement of bid (if applicable);*
- xiv. Original affidavit on non-judicial stamp paper duly verified by the Oath Commissioner about current & past litigations and proof of non-blacklisting.*
- xv. Copies of registration with Federal Board of Revenue/tax departments: All NTN registration copies.*
- xvi. Any other relevant information to facilitate in decision making.*
- xvii. Undertaking that the bid security of appropriate amount has been attached with the priced bid.*

Seal and Signature of Bidder M/S_____

(B) Financial Proposal/Priced Bid;

- a. *Duly filled-in Form of Bid and Bill of Quantities (Priced along with Preamble) & along with complete set of bidding documents prescribed in sub-clause 7.1 (b);*
- b. *Letter of Transmittal of priced bid.*
- c. *Bid Security in shape of CDR/SDR/Banker Cheque (issued by Bank), amounting to 2% of the quoted cost, from scheduled bank in Pakistan only.*

BD.12 Bid Price

12.1 *Unless stated otherwise in the Bidding Documents, the Contract shall be for the whole of the Works as described in Sub-Clause 1.1 hereof, based on the rates of Bill of Quantities duly prices on MRS/CSR of Govt. of Khyber Pakhtunkhwa adding location factor (10%) and deducting (7% withholding tax defray) adding/deducting the %age and its correspondence amount as offered by the bidder/contractor duly approved by the Employer.*

12.2 *Text of sub-clause 12.2 is deletes and replaced with;*

The bidder shall fill up the blank space in the summary of Bill of Quantities indicating in %age (percentage) above /below (offering discount/rebate) and correspondence amount, (keeping in view the instructions contained in the Preamble to Bill of Quantities, Conditions of the Contract (GCC, PCC), and specifications) over the BoQ rates & amounts duly priced on MRS/CSR KP for the Works to be performed under the Contract.

12.4 *Text of sub-clause 12.4 is deleted and replaced with;*

The prices/rates of the priced BoQ and (%age /percentage & correspondence amount,) quoted by the bidder shall remain fixed during the bidder's performance of the Contract and not subject to variation on any account. As the contract is not subject to adjustment during the performance of the Contract, as no price adjustment shall be made, hence the bidder has to quote the rate (premium/discount) very carefully keeping view this sub-clause of BD12.4.

BD.13 Currency of Bid and Payment

Sub-Clauses 13.1 & 13.2 are deleted and replaced with;

13.1 *Rates/Prices in the Bill of quantities are entered in Pakistani Rupees as per MRS/CSR of Khyber Pakhtunkhwa and shall be paid in Pakistani Rupees (PK. Rs.) to the Contractor.*

BD.14 Bid Validity

14.1 *Bids shall remain valid for the period of 120 days after the date of opening of bids.*

BD.15 Bid Security

15.1 *Amount of Bid security shall be equal to 2% of the quoted cost, bid price.*

15.2 *The Bid Security shall be, at the option of the bidder, a bank's instrument in the form of CDR (Call Deposit Receipt), SDR (Security Deposit Receipt), Pay Order, Demand Draft. Bank Draft or Banker's Cheque (Cheque issued by Bank) of Scheduled Bank in Pakistan or from a foreign bank duly counter guaranteed by a Scheduled Bank in Pakistan in favor of the Employer valid for a period 30 days beyond the Bid Validity date.*

15.4 *The bid securities of unsuccessful bidders will be returned upon submission of written request of the bidders to the employer, after uploading of the bid evaluation report in the official website of Shaheed BB University Sheringal Dir Upper, but not later than 30 days after the expiration of the period of Bid Validity.*

BD.16 Alternate Proposal by the Bidder

Sub-Clauses 16.1 & 16.2 are deleted in Toto.

Seal and Signature of Bidder M/S_____

BD.17 Pre-Bid meeting

- 17.1** *No pre-bid meeting shall be held. The bidders shall have to submit their queries, if any, in writing at the employer address, (7) seven day prior to opening of bids, necessary action/amendment, if deemed required/suitable by the employer, shall be uploaded on university website by the employer, hence the bidder has to visit university website on second last day (one day prior) of submission of bids.*

BD.18 Format and Signing of Bid

- 18.4** *Each bidder shall prepare by filling out the forms completely and without alterations one (1) original documents comprising the bid as described in Clause IB.7 and clearly mark them "ORIGINAL".*
- 18.5** *Format of power of attorney is provided in the bidding documents.*

BD.19 Sealing & Marking of Bids

- 19.1** Employer's address for the purpose of Bid submission:

As shown in the Notice Inviting Tenders (NIT) / Invitation for Bid.

BD.20 Deadline for Submission of Bids

- 20.1** *As shown in the Notice Inviting Tenders (NIT) / Invitation for Bid.*

BD.23 Bid Opening

- 23.1** *As shown in the Notice Inviting Tenders (NIT) / Invitation for Bid.*

BD.26 Examination of Bids and Determination of Responsiveness;

(a) the Employer will examine the Bids to determine whether;

- i. the bid is complete and does not deviate from the scope,*
- ii. any computational error have been made,*
- iii. required bid securities have been furnished,*
- iv. The Bid is valid till required period,*
- v. The Bid Prices are firm during currency of the contract,*
- vi. The documents have been properly signed by the Person, mentioned in Form-H/ Partnership deed.*
- vii. Completion period offered is within specified limits,*
- viii. The bidder is eligible to bid and possess requisite experience,*
- ix. conforms to all the terms, conditions and specifications of the Bidding Documents, without material deviation or reservation,*
- x. The Bids are generally in order.*

(b) A bid will not be considered, if;

- i. it is unsigned,*
- ii. its validity is less than specified,*
- iii. indicate completion period later than specified,*
- iv. it is not accompanied with bid security,*
- v. it is submitted by a bidder who has participated in more than one bid,*
- vi. it is received after the deadline for submission of bids,*
- vii. it is submitted through fax, telex, telegram or email,*
- viii. it indicates that prices quote are not firm during performance of the contract,*
- ix. the bidder refuses to accept arithmetic correction (s)*
- x. The submitted bid is conditional,*
- xi. It limits the bidder's obligation in any way under the contract*
- xii. It is materially and substantially different from the conditions and specifications of the bidding documents.*

Seal and Signature of Bidder M/S_____

BD.27 Correction of Errors

Sub-Clauses 27.1.b is replaced with;

- i. *Where there is a discrepancy between the premium or discount as the case may be offered by the bidder, in figures and in words the words will govern,*
- ii. *Where there is discrepancy between percentage offered by the bidder and correspondence amount, the percentage offered by the bidder shall govern and the correspondence amount will be corrected.*

If in the opinion of the Employer there is obviously gross misplacement of the decimal point in the percentage, in which case the total amount as quoted shall govern and the percentage will be corrected.

BD.28 Evaluation and Comparison of Bids

28.1 *Bid Opening & Evaluation Committee shall evaluate the bids, in the following two stages as given in these documents and eligibility criteria (refer ITB.26) for qualification of bidders which shall be determined in accordance to criteria set herein below from the documents submitted by the bidders, prescribed in BD-11(A). Bidder scoring 60% (sixty percent) and above marks shall be declared as pass/technically qualified. No compromise shall be made on minimum requirement of 50% score in each category i.e. experience, personnel capabilities, financial position and equipment capabilities.*

Criteria for Qualification of bidders shall be as;

1. Experience

Credit Marks (score) for experience shall be awarded on the basis of following qualifications:

Sr. #	Description	Detailing	Weightage
i)	<i>Projects of similar nature and complexity completed over last 10 years.(At least Rs. 60 Million each Project)</i>	<i>5 marks/each project</i>	<i>20</i>
ii)	<i>Projects of similar nature and complexity in hand.(At least Rs. 60 Million each Project).</i>	<i>5 marks /each project</i>	<i>10</i>
iii)	<i>Experience of Works related to this bid but not basic Part (Public Health, Water supply, Roads, Bridges, HVAC, E/M etc.).</i>	<i>1 mark/ each project</i>	<i>5</i>
iv)	<i>Status of enlistment with Government Organizations and other agencies.</i>	<i>1 mark/ each Deptt.</i>	<i>5</i>
Sub-total:			40

Seal and Signature of Bidder M/S_____

2. Personnel Capabilities

Credit Marks shall be awarded under this category using the following criteria:

Sr. #	Description	Detailing	Weightage
i)	Graduates in employment of the firm in relevant field. a) Number b) Experience (in number of years)	01 Nos. 05 years/each	6 3
ii)	DAE/Certificate holders in Employment of the Firm in relevant field. a) Number b) Experience (in number of Years)	02 Nos. 05 years/each	4 2
Sub-total:			15

3. Financial Position

Credit Marks shall be awarded on the basis of the following criteria:

Ser. #	Description	Detailing	Weightage
i)	Available Bank Credit Line	5 marks/ 7 million	5
ii)	Working Capital in last 3 years.	1.5 mark/ 7 million	5
iii)	Registration with Income Tax Department	Yes=5	5
iv)	Litigation History where decision went against the Firm (Original)	No=5	5
v)	Blacklisting from any Agency (Original)	No=5	5
Sub-total:			25

4. Equipment Capability:

Credit Marks shall be awarded on the basis of the following criteria:

Sr. #	Description	Marks Assigned	Explanation for Marks Obtained
1	Dumper Trucks (1 No.)	10	<p align="center">Total Marks = (Marks Obtained/ 120) * 20</p>
2	Shovel/ Loader/ Backhoe (1 No.)	10	
3	Steel cutting & Bending Machine (1 No.)	10	
4	Form Work (10000 Sft)	10	
5	Scaffolding Pipe (10000Rft)	10	
6	Concrete Mixer (2 Nos.)	10	
7	Lift with Machine (2 Nos.)	10	
8	Generator Set (10KVA) (1 No.)	10	
9	Vibrator (2 Nos.)	10	
10	Water Pump (02 HP) (2 Nos.)	10	
11	Plate Compactor (2 Nos.)	10	
12	Tractor /Trolley /Pickup (1 No.)	10	
Total Marks Allocated			20

Seal and Signature of Bidder M/S_____

For Joint Venture (JV), award of credit marks criteria shall be as under:

- (i) The lead partner shall meet not less than 40% of all qualifying criteria.
- (ii) Each of the partners shall meet not less than 25% of all the qualifying criteria.
- (iii) The joint venture must collectively satisfy the criteria for which purpose the relevant figures for each of the partners shall be added together to arrive at the JV's total capacity.
- (iv) Any change in a prequalified JV after prequalification, shall be subject to the written approval of the Employer prior to the deadline for submission of bids. Such approvals may be denied if:
 - a. Partner(s) withdraw from a JV and remaining partners do not meet the qualifying requirements.
 - b. The new partners to JV are not qualified individually or as another JV; or
 - c. In the opinion of the Employer, a substantial reduction in competition would result, and
 - d. Bid shall be signed by all members in the JV so as to legally bind all partners, jointly and severally, and any bid shall be submitted with a copy of the JV agreement providing the joint and several liabilities with respect to the contract.
 - e. The prequalification of a JV does not necessarily prequalify any of the partners individually or as a partner in any other JV or association. In case of dissolution of a JV, each one of the constituent firms may prequalify if they meet all the prequalification requirements and any partner of JV has requested/ shall request for the same and then his prequalification shall be subject to the written approval of the Employer.

(B) Envelop -II (Financial Proposal);

Financial proposals of only Eligible, Qualified/Technically Responsive bidders opened by the bid opening committee shall be placed for evaluation by following steps mentioned under clause ITB-26 and BD.26.

BD.28.3 it was clarified under Sub-Clause BD.12.4 the bid/contract is not subject to price adjustment.

BD.32 Performance Security

- 32.1 The Performance Security on the standard form shall be submitted within 28 days of issuance of Letter of Acceptance and shall be equal to an amount of 10% of the Contract Price stated in the Letter of Acceptance valid up to Defect Liability Period of the project. Such Security shall be in the form of unconditional Bank Guarantee from any Scheduled Bank of Pakistan **or** in the form of Performance Bond/Security from Insurance Companies having Rating of AA+ rated by Credit Rating Companies approved by Security Exchange Commission of Pakistan (SECP) i.e. The Pakistan Credit Rating Agency Limited (PACRA) or JCR-VIS Credit Rating Company Limited.

Add Sub-Para 32.3;

- 32.3 The bidder who offered/quoted more than 10% below the estimated cost shall provide additional performance security @ 8% of bid price (ITB-28.4).

Seal and Signature of Bidder M/S_____

BD.37 Add new Sub-Clauses as;

- 37.1 *The successful bidder shall deposit an amount of Rs. 18,750 in Govt. Treasury as stamp duty or shall be deducted from the running bill of the contractor.*
- 37.2 *Contract Agreement, Performance Bond, Indemnity Bond, Integrity Pact, etc. shall be submitted by the successful bidder on the Non-Judicial Stamp Paper of minimum Rs 50/- each.*
- 37.3 *The Successful bidder upon award of contract and signing the contract shall arrange 06 (Six) copies of contract documents for the exclusive use of different sections of the employer, consultant and contractor.*
- 37.4 *The successful bidder upon the award of the contract shall purchase FIDIC Conditions via online payment at the address mentioned in bid documents before signing the contract and shall submit to the Employer the original document.*
- 37.5 *The above specific data i-e Bidding data (BD) for the Works to be bided shall complement, amend, or supplement the provisions in the Instructions to Bidders (ITB). Wherever there is a conflict, the provisions herein above under bidding data (BD) shall prevail over those in the Instructions to Bidders (ITB).*

FORM OF BID (LETTER OF OFFER)

To

The Vice Chancellor
Shaheed Benazir Bhutto University,
Sheringal, Dir Upper

Subject: Construction of Multipurpose Hall, at Shaheed Benazir Bhutto University, Sheringal, Dir Upper

1. Having examined the Bidding Documents including Instructions to Bidders, Bidding Data, Conditions of Contract (GCC/PCC), Specifications (Special, Technical), Drawings, Engineer's Estimate/BOQ along with preamble, and the site for the execution of the above-named Works, we, the undersigned, offer to execute and complete such Works and remedy any defects therein in conformity with the Conditions of the Contract (GCC, PCC), Specifications (Special, Technical), Drawings, and Bill of Quantities at ____% (____Percent)____ (above/below) the Engineer's Estimate, for the sum of Rs.____ (in figure) (Rupees in Words____ as inserted in Summary of Estimates.
2. We understand that all the Appendices attached hereto form part of this Bid.
3. As security for due performance of the undertakings and obligations of this Bid, we submit herewith a Bid Security drawn in your favor or made payable to you and valid for a period of twenty eight (28) days beyond the period of validity of Bid.
4. We undertake, if our Bid is accepted, to commence the Works and to complete the whole of the Works comprised in the Contract within the time stated in Appendix-A to bid.
5. We agree to abide by this Bid for the period of 120 days from the date fixed for receiving the same and it shall remain binding upon us and may be accepted at any time before the expiration of that period.
6. Unless and until a formal Agreement is prepared and executed, this Bid, together with your written acceptance thereof, shall constitute a binding contract between us.
7. We undertake, if our Bid is accepted, to execute the Performance Security referred to in Conditions of Contract for the due performance of the Contract.
8. We understand that you are not bound to accept the lowest or any bid you may received.
9. We do hereby declare that the Bid is made without any collusion, comparison of figures or arrangement with any other person or persons making a bid for the Works.

Dated this _____ day of _____, 2019

Signature in the capacity of _____ duly authorized to sign bid for and on behalf of _____ (Name of Bidder in Block Capitals) (Seal)

Witness:

Seal and Signature of Bidder M/S _____

FORM OF BID (LETTER OF TECHNICAL BID)

To

The Vice Chancellor
Shaheed Benazir Bhutto University,
Sheringal, Dir Upper

Subject: Construction of Multipurpose Hall, at Shaheed Benazir Bhutto University, Sheringal, Dir Upper

We, the undersigned, declare that:

1. We have examined and have no reservations to the Bidding Documents, including Addenda_____ issued in accordance with Instructions to Bidders (ITB-9).
2. We offer to execute and complete in conformity with the Bidding Documents the bidding Works.
3. Our Bid consisting of the Technical Bid and the Price Bid shall be valid for a period of 120 days from the date fixed for the bid submission deadline in accordance with the Bidding Documents, and it shall remain binding upon us and may be accepted at any time before the expiration of that period.
4. As security for due performance of the under takings and obligations of our bid, we submit here with a Bid security, in the amount specified in Bidding Data Sheet, which is valid (at least) 28 days beyond validity of Bid itself.
5. We are not participating, as a Bidder or as a subcontractor, in more than one bid in this bidding process.
6. We agree to permit Employer or its representative to inspect our accounts and records and other documents relating to the bid submission and to have them audited by auditors. This permission is extended for verification of any information provided in our Technical Bid which comprises all documents enclosed herewith in accordance with IB.11 and Bidding Data.

Dated this _____ day of _____, 2019

Signature in the capacity of _____ duly authorized to sign bid for and on behalf of _____ (Name of Bidder in Block Capitals) (Seal)

Witness:

Seal and Signature of Bidder M/S _____

FORM OF BID (LETTER OF PRICE BID)

To

The Vice Chancellor
Shaheed Benazir Bhutto University,
Sheringal, Dir Upper

Subject: Construction of Multipurpose Hall, at Shaheed Benazir Bhutto University, Sheringal, Dir Upper

We, the undersigned, declare that:

1. We have examined and have no reservations to the Bidding Documents, including Addenda_____ issued in accordance with Instructions to Bidders (ITB-9),
2. Our Bid Prices are as follows:
 - a. The Total Price of our Bid, excluding any discounts offered is: Rs. _____(in figure) Rupees._____ (in words).
 - b. The Discounts offered (if any) and the methodology for their application are: Rs. _____(in figure) Rupees._____ (in words)
 - c. Net / Discounted/ Total Bid Price: Rs. _____(in figure) Rupees._____ (in words).
3. Our Bid shall be valid for a period of 120 days from the date fixed for the bid submission deadline in accordance with the Bidding Documents, and it shall remain binding upon us and may be accepted at any time before the expiration of that period,
4. If our Bid is accepted, we commit to obtain a performance security in accordance with the Bidding Documents,
5. We understand that this bid, together with your written acceptance thereof included in your notification of award, shall constitute a binding contract between us, until a formal contract is prepared and executed and we do hereby declare that the Bid is made without any collusion, comparison of figures or arrangement with any other bidder for the works,
6. We understand that you are not bound to accept the lowest evaluated bid or any other bid that you may receive,
7. We agree to permit Employer or its representative to inspect our accounts and records and other documents relating to the bid submission and to have them audited by auditors. This permission is extended for verification of any information provided in our Technical Bid which comprises all documents enclosed herewith in accordance with ITB.11.3 of the Bidding Data,
8. If awarded the contract, the person named below shall act as Contractor's Representative.

Dated this _____ day of _____, 2019

Signature in the capacity of _____ duly authorized to sign bid for and on behalf of _____(Name of Bidder in Block Capitals) (Seal)

Witness:

Seal and Signature of Bidder M/S _____

SPECIAL STIPULATIONS

Clause (Conditions of Contract)

Ser.	Description	Ref Clause of GCC/PCC	Remarks/Clarification
1.	Engineer's Authority to issue Variation in emergency	2.1	1% of the Contract Price stated in the Letter of Acceptance.
2.	Amount of Performance Security	10.1	10% of Contract Price or as stated in the Letter of Acceptance.
3.	Time for Furnishing Program	14.1	Within 21 days from the date of receipt of Letter of Acceptance.
4.	Minimum amount of Third Party Insurance	23.2	Rs. 3, 00, 000/- per occurrence with number of occurrences unlimited.
5.	Time for Commencement	41.1	Within 07 days from the date of receipt of Engineer's Notice to Commence which shall be issued within seven (7) days after signing of Contract Agreement or earlier if agreed.
6.	Time for Completion	43.1, 48.2	10 months from the date of receipt of Engineer's Notice to Commence.
7.	Amount of Liquidated Damages	47.1	0.10% (one tenth of one percent) for each day of delay in completion of the Works subject to a maximum of 10% of Contract Price stated in the Letter of Acceptance.
8.	Defects Liability Period	49.1	10 months from the effective date of Taking Over Certificate.
9.	Percentage of Retention Money	60.2	10 % of the amount of Interim Payment Certificate.
10.	Limit of Retention Money	60.2	5 % of Contract Price stated in the Letter of Acceptance or value of work done (whichever is higher)
11.	Minimum amount of Interim Payment Certificates (Running Bills)	60.2	Rs. 6.00 (Six) million.
12.	Time of Payment from delivery of Engineer's Interim Payment Certificate to the Employer.	60.10	30 (thirty) days.

Seal and Signature of Bidder M/S_____

Appendix-B to Bid

FOREIGN CURRENCY REQUIREMENTS

----- NOT USED -----

Seal and Signature of Bidder M/S_____

Appendix-C to Bid

PRICE ADJUSTMENT UNDER CLAUSE 70 OF CONDITIONS OF CONTRACT

Appendix –C to bid

The bid/contract is not subject to price adjustment during performance of the contract. All the clauses in these bidding documents especially clause 70.1 of the conditions of the contract are hereby deleted.

Being fixed price contract, the bidder shall quote the rate(s)/percentage/discount/premium keeping in view the point (that the contract is fixed priced contract).

Seal and Signature of Bidder M/S_____

BILL OF QUANTITIES (PREAMBLE)

1. The Bill of Quantities shall be read in conjunction with the Conditions of Contract, Specifications, MRS/CSR, its remarks, Rate Analysis, Detailed Descriptions of CSR/MRS, Drawings and other documents as mentioned in Instructions to bidders/bidding data & GCC/PCC.
2. The quantities given in the Bill of Quantities are only estimated and provisional, and are given to provide a common basis for bidding. The basis of payment will be the actual quantities of work executed and measured by the Contractor and verified by the Engineer and valued at the rates and prices entered in the priced Bill of Quantities by the employers, adding location factor (10%), deducting/defray (7% withholding tax) and adding/deducting %age (percentage) (premium/discount) quoted by the bidders.
3. Descriptions of the items of works entered in the priced BoQ are modified by the employer keeping in view the detailed description of CSR and the requirement of work/contract & site, hence shall be considered by the bidders during bidding and by the contractor during performance of contract, without extra claim and shall be deemed considered by the bidder while quoting rate. Pro-rata from CSR/MRS are adopted for some of the items, keeping in view its nature of works included in the item(s), hence shall be considered by the bidders while quoting %age/rate over the MRS/CSR rates.
4. It shall be deemed while quoting %age (\pm) over the priced BoQ, that rates and prices entered in the priced BoQ shall, except insofar as it is otherwise provided under the Contract include all costs of Contractor's plant, labour, supervision, materials, execution, insurance, profit, taxes and duties, together with all general risks, liabilities and obligations set out or implied in the Contract. Furthermore all duties, taxes and other levies payable by the Contractor under the Contract, or for any other cause, as on the date 28 days prior to deadline for submission of Bids, is included in the bid.
5. The items mentioned in the Bill of Quantities consist of furnishing all plant, labour, equipment, machinery, appliances, materials, fittings, fixtures, fabrication, erection and installation required for completing the items/works.
6. Notwithstanding provision of Clause 51 of the General Conditions of Contract, no claim for extra payment will be admissible on account of anticipated profit or variation in overheads expenditure for the works not actually performed nor will any adjustment in the unit rate set forth in the Bill of Quantities by the Employer or percentage offered by the bidder/contractor, be made because of any increase or decrease in the quantities indicated therein.
7. Tax @ 7% included in rates of MRS/CSR shall not be paid to the bidder/contractor pertaining to tax exempted area and shall be deducted from Bill. Rate analysis of the MRS for each item is based on cost of material and labour, adding 22% over material and labour (as 10% contractor's profit, 5% overhead charges and 7% to meet withholding tax). The amount equal to 7% (added by CSR cell for meeting withholding tax by bidder/ contractor/ constructors/ firms) shall be deducted/reduced from the engineer's estimates/BoQ for those contractors pertaining to tax exempted area being not payable by him to the Govt., however the same (7%) withholding tax shall not be deducted from the estimate (as defray) but shall be deducted from bills of those contractors not pertaining to tax exempted area as per Govt. policy and shall be paid to concern tax authority.
8. The whole cost of complying with the provisions of the Contract shall be included in the quoted rate/ %age/ premium/ discount in the summary of priced Bill of Quantities.
9. Bills of Quantities (BoQ) is priced by the employer adopting rates of the MRS/CSR of Govt. of Khyber Pakhtunkhwa. Any item where rate is not entered (erroneously) by the employer shall be taken from the MRS/CSR.

Seal and Signature of Bidder M/S _____

10. The execution of items and quantities of BOQ are subject to the in writing approval of the Engineer and may be increased, decreased even deleted during execution by the Engineer, hence the rate/ %age/ premium/ discount shall be entered vary carefully by the bidders.
11. Variation Order if required, due to any reason shall be valued at the rates of Priced BoQ adding/deducting %age (premium/discount) quoted by the bidders. In case of non-availability in the contract, the rates of MRS-2017 (i-e CSR KP) with %age (\pm) shall be adopted. However if there are some Non-Schedule items, they shall be analyzed from current market rates along with addition of 15% (i-e 10% Contractor Profit and 5% overhead charges) and (7% for withholding tax if the contractor is not belonging to tax exempted area).
12. Instructions for pricing of bid and quoting rates (%age) over summary of estimates shall be deemed considered by the bidders.
13. The contract price (comprising BoQ rates of MRS, and %age, premium or discount offered by the bidder and approved by the employer) shall not be subject to adjustment during the performance of the Contract.
14. The bidders shall quote percentage premium/discount (\pm) in the summary of estimates over the items of BoQ duly priced on MRS/CSR and Non-Schedule items.
15. Units of measurements, symbols and abbreviations shall comply with the FPS System except Steel Reinforcement which is in MKS.

Seal and Signature of Bidder M/S_____

Appendix - D to Bid

BILL OF QUANTITIES

BOQs (VOLUME-III)

TO BE FILLED AND SEALED IN SEPARATE ENVELOPE AND SUBMITTED AS “PRICED BID”

Seal and Signature of Bidder M/S_____

PROPOSED CONSTRUCTION SCHEDULE

Pursuant to Sub-Clause 43.1 of the General Conditions of Contract, the Works shall be completed on or before the date stated in Appendix-A to Bid (Engineer's Notice to Commence Work). The Bidder shall provide the Construction Schedule in the bar chart (CPM, PERT, M/S Project or Prima Vera) showing the sequence of work items and the period of time during which he proposes to complete each work item in such a manner that his proposed program for completion of the whole of the Works and parts of the Works may meet Employer's completion targets in days noted below and counted from the date of receipt of Engineer's Notice to Commence.

Note: - Sunday shall be the holyday, similarly slack season of January to March and other gazette leaves shall be considered in schedule.

<u>Description</u>	<u>Time for Completion</u>
Whole Works	10 months
a) Mobilization at site	_____ days
b)	
-----be continued accordingly-----	

Seal and Signature of Bidder M/S_____

METHOD OF PERFORMING THE WORK

[The Bidder is required to submit a narrative outlining the method of performing the Work. The narrative should indicate in detail and include but not be limited to:

1. Organization Chart indicating head office and field office personnel involved in management and supervision, engineering, equipment maintenance and purchasing.
2. Mobilization in Pakistan, the type of facilities including personnel accommodation, office accommodation, provision for maintenance and for storage, communications, security and other services to be used.
3. The method of executing the Works, the procedures for installation of equipment and machinery and transportation of equipment and materials to the site.

LIST OF MAJOR EQUIPMENT – RELATED ITEMS

[The Bidder will provide a list of all major equipment and related items, under separate heading for items owned, to be purchased or to be arranged on lease by him to carry out the Works. The information shall include make, type, capacity, and anticipated period of utilization for all equipment which shall be in sufficient detail to demonstrate fully that the equipment will meet all requirements of the Specifications.]

LIST OF MAJOR EQUIPMENT

Owned Purchased or Leased	Description of Unit (Make, Model, Year)	Capacity HP Rating	Condition	Present Location or Source	Date of Delivery at Site	Period of Work on Project
1	2	3	4	5	6	7
Owned						
To be Purchased						
To be arranged on Lease						

Seal and Signature of Bidder M/S_____

CONSTRUCTION CAMP AND HOUSING FACILITIES

The Contractor in accordance with Clause 34 of the Conditions of Contract shall provide description of his construction camp's facilities and staff housing requirements.

The Contractor shall be responsible for pumps, electrical power, water and electrical distribution systems, and sewerage system including all fittings, pipes and other items necessary for servicing the Contractor's construction camp.

The Bidder shall list or explain his plans for providing these facilities for the service of the Contract as follows:

1. Site Preparation (clearing, land preparation, etc.).
2. Provision of Services.
 - a) Power (expected power load, etc.).
 - b) Water (required amount and system proposed).
 - c) Sanitation (sewage disposal system, etc.).
3. Construction of Facilities
 - a) Contractor's Office. Workshop and Work Areas (areas required and proposed layout, type of construction of buildings, etc.).
 - b) Warehouses and Storage Areas (area required, type of construction and layout).
 - c) Housing and Staff Facilities (Plans for housing for proposed staff, layout, type of construction, etc.).
4. Construction Equipment Assembly and Preparation (detailed plans for carrying out this activity).
5. Other Items Proposed (Security services, etc.).

Seal and Signature of Bidder M/S_____

ESTIMATED PROGRESS PAYMENTS
(To be included in Financial Bid)

Bidder's estimate of the value of work which would be executed by him during each of the periods stated below, based on his Program of the Works and the Rates in the Bill of Quantities, expressed in thousands of Pakistani Rupees:

Month/ Quarter/ Year/ Period	Amount (PKR – Million)
1 st Month	
2 nd Month	
3 rd Month	
4 th Month	
5 th Month	
6 th Month	
7 th Month	
8 th Month	
9 th Month	
10 th Month	
11 th Month	
12 th Month	
Total Bid Price	

Seal and Signature of Bidder M/S_____

ORGANIZATION CHART FOR SUPERVISORY STAFF FOR EXECUTION OF WORKS

Minimum supervisory staff which shall be employed by the Constructor at site for execution of works:

Designation/	Qualification with Experience	Qty
Project Manager	B.E Civil, (10 Years)	01 No
Site Inspector/Engineer	D.A.E Civil/Elect, (05 Years)	02 No

Seal and Signature of Bidder M/S_____

(INTEGRITY PACT)

**DECLARATION OF FEES, COMMISSION AND BROKERAGE ETC.
PAYABLE BY THE SUPPLIERS OF GOODS, SERVICES & WORKS IN CONTRACTS WORTH
10.00 MILLION OR MORE**

Contract Value: _____

Contract Title: _____

..... [name of Contractor/Supplier] hereby declares that it has not obtained or induced the procurement of any contract, right, interest, privilege or other obligation or benefit from Government of Pakistan (GoP) or any administrative subdivision or agency thereof or any other entity owned or controlled by GoP through any corrupt business practice.

Without limiting the generality of the foregoing, [name of Supplier] represents and warrants that it has fully declared the brokerage, commission, fees etc. paid or payable to anyone and not given or agreed to give and shall not give or agree to give to anyone within or outside Pakistan either directly or indirectly through any natural or juridical person, including its affiliate, agent, associate, broker, consultant, director, promoter, shareholder, sponsor or subsidiary, any commission, gratification, bribe, finder's fee or kickback, whether described as consultation fee or otherwise, with the object of obtaining or inducing the procurement of a contract, right, interest, privilege or other obligation or benefit in whatsoever form from GoP, except that which has been expressly declared pursuant hereto.

[-----name of Contractor/Supplier] certifies that it has made and will make full disclosure of all agreements and arrangements with all persons in respect of or related to the transaction with GoP and has not taken any action or will not take any action to circumvent the above declaration, representation or warranty.

[_____name of Contractor/Supplier] accepts full responsibility and strict liability for making any false declaration, not making full disclosure, misrepresenting facts or taking any action likely to defeat the purpose of this declaration, representation and warranty. It agrees that any contract, right, interest, privilege or other obligation or benefit obtained or procured as aforesaid shall, without prejudice to any other rights and remedies available to GoP under any law, contract or other instrument, be voidable at the option of GoP.

Notwithstanding any rights and remedies exercised by GoP in this regard, [name of Supplier] agrees to indemnify GoP for any loss or damage incurred by it on account of its corrupt business practices and further pay compensation to GoP in an amount equivalent to ten times the sum of any commission, gratification, bribe, finder's fee or kickback given by [name of Supplier] as aforesaid for the purpose of obtaining or inducing the procurement of any contract, right, interest, privilege or other obligation or benefit in whatsoever form from GoP.

Name of Buyer/Employer:

Signature:

[Seal]

Name of Contractor/Seller:

Signature:

[Seal]

Seal and Signature of Bidder M/S_____

APPROVED LIST OF MANUFACTURERS

The manufacturers reference provided herein below are indicative of minimum quality and specifications required for such materials. Any other manufacturer items having at least the same quality and specifications are acceptable subject to the approval of the Employer/Engineer.

The Contractor should note that only material from those manufacturers specified in the list of approved manufacturers shall be allowed to be used on this project. The contractor shall submit literature, catalogue and samples etc. of all the items from each of the specified manufacturer to the employer/engineer whose decisions shall be final. For finishing items like painting, tiling, etc. Mock-up samples shall be provided for approval of the Engineer/Employer.

Onus lies with the contractor for establishing the genuineness of any material, product, item for its make. Origins are as specified below.

Ser.	Description	Manufacturer
1	Crushed Stone	Margala or equivalent approved quarry meeting the specifications/ tests
2	Sand	Lawrancepore or equivalent approved quarry meeting the specifications/ tests
3	Mild Steel Bars	Fazal, Peco, Ittehad, Metropolitan, Nawab, Razzaq, Mughal
4	Bricks	WM, 33 mark, or from approved kiln confirming the specifications.
5	Cement	Chirat, Kohat, Fuji, Askari, Bestway,
6	Paving Tiles	Tuff Tiles, Izhar, Envicrete,
7	False Ceiling	Daiken (Japan), Dampa (Denmark), Owa (Germany)
8	PVC Tiles	Decora
9	Anti Termite	Termidor, Biflex, Mirage
10	Construction Chemicals	MBT, Sika, Fosroc
11	Aluminum Works (Door and Windows)	Pak Cables, Alcop, Thermec Engg Co. Alhali Aluminum Co.
12	Paints/ Distemper	Robbialac Berger, ICI (Dulux), Paintex,
13	Iron Mongery/ Hardware	Alpha, Baber
14	Glass/glazing	Khawaja, Nawshera Prince

Seal and Signature of Bidder M/S_____

15	Sanitary Wares, Cocks, Mixers etc.	Baig, Manga, Master, Faisal, Sonex, Super Asia,
16	Glazed Ware/ WC etc.	ICL, Forte, Karam, Cera, 3 Star, Master,
17	Flushing Cistern (Plastic)	Master, Golden, Baig, Super Asia,
18	GI Pipes	IIL, Victory, Jamal, Bashir Pipes
19	GI Fittings	China Make
20	PPRC Pipes	Plastherm, Raktherm, Dadex
21	uPVC Pipes, Fittings	Shafisons Engg (Pvt) Ltd, Beta Pipes, Snow, Dadex (Nikasi)
22	CI Spun Pipes, Covers	CI Engg. Corp, Teepeu, Alphine, NPC, CME, BKM, MK Traders,
23	Gate Valve	Anwar, Super Asia
24	Stainless Steel Sinks	Atlas, Super Asia,
25	Fire Hose Cabinet and Extinguishers	Haseen Habib (Pvt) Ltd.
26	Ceramic Tiles	Master, Shabbir, Stile, Emco,
27	Wires and Cables	Fast Cables, Pakistan Cables, Newage, AGE, Pioneer Cables
28	Telephone Cables	Siemens, Pakistan Cables
29	Circuit Breakers /Change over switches	Terasaki (Japan), Hager (Imported)
30	Switches and Sockets	Bosch, Milano, Legrand, Clipsal, ABB, PPI Switch Kids,
31	PVC Pipes	Shavyl, Glaco, Beta, Popular, Tesco
32	PVC Ducts	Dura, Adamjee.
33	Lights (Fittings/ Fixtures)	Philips, Paklite, Sunlight, Indalux, Illume, Pierlite
34	Telephone Exchange	Siemens, Panasonic, Nortel
35	Fire Alarm System	Bosch, Tyco, GST UK, Siemens,

Seal and Signature of Bidder M/S_____

36	HT/LT Panels etc.	Siemens, PEL, FICO
37	Transformers/ Poles/ Structures	As per WAPDA Spec. (Siemens, Climax, J&P, PEL)
38	Earthing & Grounding Accessories	Furse, Erico, Panduit, Crosheind
39	UPS	Borri, MGE, APC, Simens
40	DG Set	Cater Pillar, FG Wilson, Siemens, Mitsubishi, Cummins Power, Perkin.
41	Alternator	Siemens, Newage, Stamford, Cummins, Leroy Somer (France) Cater Pillar.
42	Ceiling fans	Asia, Millat, Climax, GFC, Younas, Pak Fans, Breeze
43	Exhaust and Bracket fans	Younas, Pak Fans
44	Cooking Rang	Skyflame, Nasgas, Corona
45	Gas Room Heater	Nasgas, Firex, Singer, Ravi, Corona, Tasfa, Marvel,
46	Geyser	Singer, Nasgas, Ambassador, Corona, Admiral,
47	Water Cooler	Meco, Comfort, Tasfa, Nasgas, Corona,
48	Water Filters	So Safe, Aqua Safe, Aqua Guard
49	Air Conditioners (Window Type)	PEL, Climax, General Agnause,
50	Air Conditioners (Split Type)	Acson, Daikin, Waves, Mitsubishi
51	Pumping set (≤ 5 HP)	Golden, Meco
52	Pumping set (> 5 HP)	KSB with Siemens Motors, Alama Sumoto Itly

Seal and Signature of Bidder M/S_____

MISC FORMS

Seal and Signature of Bidder M/S_____

FORM OF PERFORMANCE SECURITY

Guarantee No. _____
 Executed on _____
 Expiry date _____

[Letter by the Guarantor to the Employer]

Name of Guarantor (Bank) with address: _____

Name of Principal (Contractor) with address: _____

Penal Sum of Security (express in words and figures) _____

Letter of Acceptance No. _____ Dated _____

KNOW ALL MEN BY THESE PRESENTS, that in pursuance of the terms of the Bidding Documents and above said Letter of Acceptance (hereinafter called the Documents) and at the request of the said Principal we, the Guarantor above named, are held and firmly bound unto the _____ (hereinafter called the Employer) in the penal sum of the amount stated above for the payment of which sum well and truly to be made to the said Employer, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the Principal has accepted the Employer's above said Letter of Acceptance for _____ (Name of Contract) for the _____ (Name of Project).

NOW THEREFORE, if the Principal (Contractor) shall well and truly perform and fulfill all the undertakings, covenants, terms and conditions of the said Documents during the original terms of the said Documents and any extensions thereof that may be granted by the Employer, with or without notice to the Guarantor, which notice is, hereby, waived and shall also well and truly perform and fulfill all the undertakings, covenants terms and conditions of the Contract and of any and all modifications of said Documents that may hereafter be made, notice of which modifications to the Guarantor being hereby waived, then, this obligation to be void; otherwise to remain in full force and virtue till all requirements of Clause 49, Defects Liability, of Conditions of Contract are fulfilled.

Our total liability under this Guarantee is limited to the sum stated above and it is a condition of any liability attaching to us under this Guarantee that the claim for payment in writing shall be received by us within the validity period of this Guarantee, failing which we shall be discharged of our liability, if any, under this Guarantee.

We, _____ (the Guarantor), waiving all objections and defenses under the Contract, do hereby irrevocably and independently guarantee to pay to the Employer without delay upon the Employer's first written demand without cavil or arguments and without requiring the Employer to prove or to show grounds or reasons for such demand any sum or sums up to the amount stated above, against the Employer's written declaration that the Principal has refused or failed to perform the obligations under the Contract which payment will be effected by the Guarantor to Employer's designated Bank & Account Number.

PROVIDED ALSO THAT the Employer shall be the sole and final judge for deciding whether the Principal (Contractor) has duly performed his obligations under the Contract or has defaulted in fulfilling said obligations and the Guarantor shall pay without objection any sum or sums up to the amount stated above upon first written demand from the Employer forthwith and without any reference to the Principal or any other person.

IN WITNESS WHEREOF, the above-bounden Guarantor has executed this Instrument under its seal on the date indicated above, the name and corporate seal of the Guarantor being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

Guarantor (Bank/Insurance)

Witness:

1. Signature;
 Name
 Corporate Secretary (Seal)
 Title
2. Name, Title & Address
 Corporate Guarantor (Seal)

Seal and Signature of Bidder M/S _____

FORM OF CONTRACT AGREEMENT

THIS CONTRACT AGREEMENT (hereinafter called the "Agreement") made on the _____ day of _____ (month) 20____ between _____ (hereafter called the "Employer") of the one part and _____ (hereafter called the "Contractor") of the other part.

WHEREAS the Employer is desirous that certain Works, viz _____ should be executed by the Contractor and has accepted a Bid by the Contractor for the execution and completion of such Works and the remedying of any defects therein.

NOW this Agreement witnesseth as follows:

1. In this Agreement words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contract hereinafter referred to.
2. The following documents after incorporating addenda, if any, except those parts relating to Instructions to Bidders shall be deemed to form and be read and construed as part of this Agreement, viz:
 - (a) The Contract Agreement;
 - (b) The Letter of Acceptance;
 - (c) The completed Form of Bid;
 - (d) Special Stipulations (Appendix-A to Bid);
 - (e) The Particular Conditions of Contract – Part II;
 - (f) The General Conditions – Part I;
 - (g) The priced Bill of Quantities (Appendix-B to Bid);
 - (h) The completed Appendices to Bid (C, D, E etc.);
 - (i) The Drawings;
 - (j) The Specifications.
 - (k) _____ (any other)
3. In consideration of the payments to be made by the Employer to the Contractor as hereinafter mentioned, the Contractor hereby covenants with the Employer to execute and complete the Works and remedy defects therein in conformity and in all respects with the provisions of the Contract.
4. The Employer hereby covenants to pay the Contractor, in consideration of the execution and completion of the Works as per provisions of the Contract, the Contract Price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.

IN WITNESS WHEREOF the parties hereto have caused this Agreement to be executed on the day, month and year first before written in accordance with their respective laws.

Signature of the Contactor

(Seal)

Signature of Employer

(Seal)

Seal and Signature of Bidder M/S _____

**INDEMNITY BOND FOR SECURED ADVANCE
AGAINST MATERIAL BROUGHT AT SITE**

(ON RS. 100 NON-JUDICIAL STAMP PAPER)

THIS DEED OF INDEMNITY is issued by M/s. _____
 _____ (Name of the Contractor) in favour of
 M/s. _____ (Name of Employer)

WHEREAS _____ (hereinafter called Employer) has paid the Secured Advance against the cost of material through any Bank or like Agency by any other method by virtue of the terms of the Contract existing between the parties. The details of the material and their price for which Secured Advance is being sought for the period from _____ till consumption of the material is as under:

1. _____	at Rs. _____	Per _____	=Rs. _____
2. _____	at Rs. _____	Per _____	=Rs. _____
3. _____	at Rs. _____	Per _____	=Rs. _____
4. _____	at Rs. _____	Per _____	=Rs. _____

THEREFORE, THIS DEED OF INDEMNITY WITNESSETH AS FOLLOWS:-

I/We _____ of M/s. _____

do hereby indemnify M/s. _____ for all losses due to thefts, arson, pilferage, loss due to flood and inundation, shortages deterioration and depreciation etc. through any act of man or God or slump in the market, of, any or all the materials financed or paid by the Employer on our request for _____ financing payment against material.

I/We _____ shall indemnify _____ against any or all claims, action damages arising out of or resulting to the said material.

I/We _____ further declare that we will faithfully abide by the above declaration and solemnly affirm that we will not remove, sell, pilfer, damage any of the materials against which M/s. _____ has paid us such a secured advance and will not pledge the same with any Bank, Finance Corporation, Firm company, Individual or like the Agency or create any charge their on, in any form whatsoever.

I/We _____ do hereby also declare that in the event of my/our infringement of the declaration made above _____ will be entitled to forfeit all such material and also proceed against me/us according to the relevant clause pertaining to breach of contract and further invoke the power of seek any remedies secured of _____ under the Contract Agreement signed with us or otherwise available under law.

Place _____

Dated _____

Contractor _____

Seal and Signature of Bidder M/S _____

Shall be submitted by the bidder/contractor on non-judicial stamp paper of Rs. 50/- or above.

POWER OF ATTORNEY

BID NAME; “-_____”

KNOW ALL MEN BY THESE PRESENTS that the undersigned Mr. _____S/O Mr._____CNIC.No._____-_____-____ address_____ owner of the Firm MS_____ (hereinafter called the bidder/contractor) does hereby appoint Mr. _____ S/O Mr._____ CNIC No._____-_____-____ address_____, whose signature appears below, to be the true and lawful attorney, and authorized the said attorney to sign the bids, running bills, variation orders, collect cheques and execute all the necessary matters related thereto (other than those mentioned below), in the name and on behalf of the bidder/contractor in connection with the execution, completion and remedy therein any defect of the Contract for the “_____ at Shaheed BB University Sheringal, Dir Upper ” as per bid/contract documents.

WHEREAS;

1. This power of attorney shall be considered and treated cancelled if so directed by the employer due to any reason (as per Conditions of the Contract).
2. This Power of attorney is revocable and can be terminated at any stage by the bidder/contractor.
3. The contract agreement and final bill shall not be signed by the attorney holder.
4. The attorney holder is not entitled to sue against the employer.
5. The attorney holder is not authorized to open bank account in his own name for receiving and depositing cheques from the employer in respect of above bid/contract.
6. The attorney is not authorized to terminate the contract.

AND WHEREAS; This power of attorney is not subletting of contract.

- Signature of the Owner of the Firm/Company (Bidder/Contractor):_____
- Name of the Owner of the Firm/Company (Bidder/Contractor):_____
- CNIC No of the Owner of the Firm/Company (Bidder/Contractor):_____
- Seal and Name of Firm/Company: M/S_____

- Signature of the Attorney:_____
- Name of the Attorney: _____
- CNIC No of the Attorney: _____

<p>Witness-1.</p> <p>Signature:_____</p> <p>Name:_____</p> <p>CNIC No:_____</p> <p>Address: _____</p>	<p>Witness-II.</p> <p>Signature:_____</p> <p>Name:_____</p> <p>CNIC No:_____</p> <p>Address: _____</p>
---	--

Dated on _____ day of _____ [date of signing]

Note: The Bidder should include such Power of Attorney in its bid in original, if he desired to appoint an attorney.

Seal and Signature of Bidder M/S_____

Shall be submitted by the bidder/contractor on non-judicial stamp paper of Rs. 50/- or above.

DECLARATION FOR SECURITY AND SECRECY AT SHAHEED BB UNIVERSITY

We the M/S_____ & Co. (the bidder/contractor) do hereby solemnly declare on oath that;

1. We shall abide the University Rules and Regulations in addition to responsibilities assigned to us under the contract,
 2. We shall not share the data, information, secrecy pertaining to the university as well as our contract, i-e drawings and other documents of the Project with irrelevant persons/ organizations,
 3. We shall hire only Pakistani labour of good character and not the foreigners, unless required for a particular job as per bid/contract (for which we shall submit request for prior approval of the Competent Authority of Shaheed BB University Sheringal, Dir Upper),
 4. We shall not involve in any political activity in the University premises against the University.
- Signature of the Owner of the Firm/Company (Bidder/Contractor):_____
 - Name of the Owner of the Firm/Company (Bidder/Contractor):_____
 - CNIC No of the Owner of the Firm/Company (Bidder/Contractor):_____
 - Seal and Name of Firm/Company: M/S_____

Seal and Signature of Bidder M/S_____

PART – I
GENERAL CONDITIONS OF CONTRACT
(GCC)

Seal and Signature of Bidder M/S_____

PART-1

GENERAL CONDITIONS OF THE CONTRACT (GCC)

Over the years, a number of model general conditions of contract have evolved. The one used in these bidding documents was prepared by the international federation of consulting engineers (' Federation of International Des Ingenieurs-Council or FIDIC) and is commonly known as FIDIC conditions of contract. (The used version is the Fourth Edition (1987), Reprinted in 1988, with editorial amendments, Reprinted in 1992, with further amendments).

The standard text of the General Conditions of Contract chosen are retained intact to facilitate its reading and interpretation by bidders and its review by client. The amendment and addition to the General Conditions specific to the Contract in hand, has been introduced in the particular conditions of the contract.

The FIDIC Conditions of the contract are copyrighted and shall not be copied, faxed or reproduced. Without taking any responsibility of its being accurate, Pakistan Engineering Council with prior consent of FIDIC secretariate has allowed the FIDIC General condition for reference purpose only which can not be used by the user for preparing their bidding documents.

The successful bidder after award of the work/contract shall purchase the said FIDIC Conditions of Contract for Works of Civil Construction through on line payment as per following address and shall submit the same to the employer one copy in original for incorporation of the same in the Contract Agreement of the Work.

“Copies of the FIDIC Conditions of Contract can be obtained from:

FIDIC Secretariat

P.O. Box 86

1000 Lausanne 12

Switzerland

e-mail: fidic.pub@fidic.org – FIDIC.org/bookshop]

Seal and Signature of Bidder M/S_____

PART – II
PARTICULAT CONDITIONS OF CONTRACT
(PCC)

Seal and Signature of Bidder M/S_____

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PARTICULAR CONDITIONS OF CONTRACT (PCC)

The following specific data under Particular Conditions of the Contract (PCC) shall complement, amend, or supplement the provisions of the General Conditions. Wherever there is a conflict, the provisions herein shall prevail over those in the General Conditions.

1.2 Definitions

- (a) (i) The Employer is Shaheed Benazir Bhutto University Sheringal, Dir Upper.
- (a) (ii) Add the following text at the end:

"And who is duly registered with Pakistan Engineering Council in the appropriate category possessing valid registration."
- (a) (iv) The Engineer is M/S. Associated Consulting Engineers (ACE) Pvt. Ltd, Lahore or any person/ firm/ authority nominated by the Employer, and notified to the contractor to act in replacement of the Engineer. Provided always that except in cases of professional misconduct, the outgoing Engineers is to formulate his certificates/ recommendations in relation to all outstanding matters, disputes and claims relating to the execution of the works during his tenure.

The following sub-clause is added:
- (a)(vi) "Bidder or Tenderer" means any person or persons, company, corporation, firm or joint venture submitting a Bid or Tender.
- (b)(i) The words "if completed" in the third line and at the end of the paragraph within brackets are hereby deleted.
- (b)(v) The following is added at the end of the paragraph:

The word "Tender" is synonymous with "Bid" and the word "Tender Documents" with "Bidding Documents" and the word " Bill of Quantities" with Estimate".
- (b)(vii) The words between brackets "if any" are deleted.

The following sub-clause is added:
- (b)(ix) "Program" means the program to be submitted by the Contractor in accordance with Sub-Clause 14.1 and any approved revisions thereto.

The following paragraph is added:
- (d)(iii) "Defects Liability Certificate" means the final certificate of completion of the works issued by the Engineer certifying that the works have been completed and any defects therein have been remedied by the Contractor.
- (e)(i) The text is deleted and substituted with the following:

"Contract Price" means the sum stated in the Letter of Acceptance as payable to the Contractor for the execution, completion of the Works and as per actual work done on the site, subject to such additions thereto or deductions there from as may be made and remedying of any defects therein in accordance with the provisions of the Contract.

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The following paragraphs are added:

- (h)(i) The words Priced Bid, Commercial Bid and Financial Proposal are synonym.

2.1 Engineer's Duties and Authority

With reference to Sub-Clause 2.1(b), the following provisions shall also apply;

The Engineer shall obtain the specific approval of the Employer before carrying out his duties in accordance with the following Clauses:

- i. Consenting to the sub-letting of any part of the Works under Sub-Clause 4.1 "Subcontracting".
- ii. Certifying additional cost determined under Sub-Clause 6.4, 12.2 & 42.2 "Not Foreseeable Physical Obstructions or Conditions".
- iii. Any action under Clause 10 "Performance Security" and Clauses 21, 23, 24 & 25 "Insurance" of sorts.
- iv. Uncovering and making openings of works executed in accordance to the contract under clause 38.2.
- v. Any action under Clause 40 "Suspension".
- vi. Any action under Clause 44 "Extension of Time for Completion".
- vii. Any action under Clause 47 "Liquidated Damages for Delay" or Interim Liquidated Damages for delay (PCC Sub-Clause 47.3).
- viii. Issuance of "Taking Over Certificate" under Clause 48.
- ix. Issuing a Variation Order under Clause 51.1, 52.1 and 52.3, except:
 - a. in an emergency* situation, as stated here below, or
 - b. if such variation would increase the Contract Price by less than the amount stated in the Appendix-A to Bid.

* (If in the opinion of the Engineer an emergency occurs affecting the safety of life or of the Works or of adjoining property, the Engineer may, without relieving the Contractor of any of his duties and responsibilities under the Contract, instruct the Contractor to execute all such work or to do all such things as may, in the opinion of the Engineer, be necessary to abate or reduce the risk. The Contractor shall forthwith comply with any such instruction of the Engineer. The Engineer shall determine an addition to the Contract Price, in respect of such instruction, in accordance with Clause 52 and shall notify the Contractor accordingly, with a copy to the Employer.)
- x. Fixing rates or prices under Clause 52.
- xi. Extra payment as a result of Contractor's claims under Clause 53.
- xii. Release of Retention Money to the Contractor under Sub-Clause 60.3 "Payment of Retention Money".
- xiii. Issuance of "Final Payment Certificate" under Sub-Clause 60.8.
- xiv. Issuance of "Defect Liability Certificate" under Sub-Clause 62.1.
- xv. Certifying additional payment under Sub-Clause 65.3 & 65.6.
- xvi. Release from performance under the law under Sub-Clause 66.1.
- xvii. Any other action which may deem necessary by the Employer and may further vary according to need of the project which shall be notified to the Contractor and the Engineer.

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2.1 (c) the following words are added at the end of this Sub-Clause.

“or to order any words involving delay or any extra payment by the Employer or to make any variation of or in the Works of the Contract”.

2.2 Engineer’s Representative

Resident Engineer M/S ACE (Pvt.) Ltd. shall act Engineer’s Representative.

The following Sub-Clauses 2.7 and 2.8 are added:

2.7 Engineer Not Liable

Approval, reviews and inspection by the Engineer of any part of the Works does not relieve the Contractor from his sole responsibility and liability for the supply of materials, plant and equipment for construction of the Works and their parts in accordance with the Contract and neither the Engineer's authority to act nor any decision made by him in good faith as provided for under the Contract whether to exercise or not to exercise such authority shall give rise to any duty or responsibility of the Engineer to the Contractor, any Subcontractor, any of their representatives or employees or any other person performing any portion of the Works.

2.8 Replacement of the Engineer

“If the Employer intends to replace the Engineer, the Employer shall, not less than 14 days before the intended date of replacement, give notice to the Contractor, of the name, address and relevant experience of the intended replacement Engineer. The Employer shall not replace the Engineer with a person against whom the Contractor raises reasonable objection by notice to the Employer, with supporting particulars.”

4.1 Subcontracting

The word “the Engineer” in the third line of first paragraph is replaced with “the Employer”.

5.1 Language/s and Law

- (a) The Contract Documents shall be drawn up in the English language.
- (b) The Contract shall be subject to the Laws of Islamic Republic of Pakistan.

5.2 Priority of Contract Documents

The documents listed at (1) to (6) of the Sub-Clause are deleted and substituted with the following:

- (1) The Contract Agreement;
- (2) The Letter of Acceptance;
- (3) The completed Form of Bid;
- (4) Special Stipulations (Appendix-A to Bid);
- (5) The completed Appendices to Bid;
- (6) The Particular Conditions of Contract – Part II;
- (7) The General Conditions – Part I;
- (8) The Priced Bill of Quantities along with Preamble;
- (9) The Specifications;
- (10) The Drawings; and

In case of discrepancies between drawings, those of larger scale shall govern unless they are superseded by a drawing of later date regardless of scale. All Drawings and Specifications

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shall be interpreted in conformity with the Contract and these Conditions. Addendum, if any, shall be deemed to have been incorporated at the appropriate places in the documents forming the Contract. Descriptions of BoQ are abbreviated as per MRS/CSR descriptions, which shall be read with remarks column of MRS/CSR, rate analysis of MRS and further details are given in detailed descriptions of CSR (copy attached with CSR-1999). MRS/CSR Rate analysis and Detailed Description of CSR shall be read in conjunctions to each other for clarifications.

Further, wherever there is a conflict, between the bid/contract document submitted by the bidder/contractor and the bid document available in the official website of Shaheed BB University, the document in the website of Shaheed BB University shall prevail over those submitted by the bidder/contractor.

6.1 Custody and supply of Drawings and documents

At the end of Sub-Clause 6.1 new paragraph is added as:

The Contractor after signing the contract shall arrange 6 (six) copies of all the contract documents (i-e Volume I, II, III, & IV.) for the use and record of different sections of the Employer, Engineer and use at site at his own cost which shall be deemed included in the bid amount.

6.4 Delay and Cost of Delay of Drawings

The Sub-Clause 6.4 (b) is hereby deleted.

The following Sub-Clauses 6.6 and 6.7 are added:

6.6 Shop Drawings

The Contractor shall submit to the Engineer for review 3 copies of all shop and erection drawings applicable to this Contract as per provision of relevant Sub-Clause of the Contract.

Review and approval by the Engineer shall not be construed as a complete check but will indicate only that the general method of construction and detailing is satisfactory and that the Engineer's review or approval shall not relieve the Contractor of any of his responsibilities under the Contract.

6.7 As-Built Drawings

Upon the completion of the Works under the Contract, the Contractor shall furnish to the Engineer 6 copies and one reproducible of all drawings amended to conform to the Works as built. The price of such Drawings shall be deemed to be included in the Contract Price, and shall not be paid extra. The Engineer after due consultation with the Employer shall arrange the as built drawings and the cost as determined on production of same shall be deducted from the payment of the Contractor.

9.1 Contract Agreement

The text is deleted and substituted with the following:

- a. The Contract agreement, Performance Security, Insurance Policies /Bonds and other Bonds / Guarantees/Sureties shall be prepared and completed at the cost of the Contractors.
- b. The Contractor shall arrange six (6) copies of the contract Document (i-e all the volumes/document listed in the Contract Agreement) along-with copies of all the Bonds/ Guarantees/ Sureties, at his cost and shall submit the same to the Employer and Engineer.

Seal and Signature of Bidder M/S_____

10.1 Performance Security

The text is deleted and substituted with the following:

The Contractor shall provide Performance Security to the Employer in the prescribed form as mentioned in Bidding Documents. The said Security shall be furnished or caused to be furnished by the Contractor within 28 days after the receipt of the Letter of Acceptance. The Performance Security shall be of an amount equal to 10% of the Contract Price or as stated in the Letter of Acceptance. Such Security shall, be in the form of;

- (a) Bank Guarantee from any Scheduled Bank in Pakistan, or
- (b) Bank Guarantee from a bank located outside Pakistan duly counter-guaranteed by a Scheduled Bank in Pakistan, **or**
- (c) in form of Performance Bond/ Security from Insurance Companies having Rating of AA+ rated by Credit Rating Companies approved by Security Exchange Commission of Pakistan (SECP) i.e. The Pakistan Credit Rating Agency Limited (PACRA) or JCR-VIS Credit Rating Company Limited.**

The Performance Security shall remain valid during the currency of the contract period including Defect Liability Period.

The cost of complying with requirements of this Sub-Clause shall be borne by the Contractor.

The following Sub-Clause 10.4 is added:

10.4 Performance Security Binding on Variations and Changes

The Performance Security shall be binding irrespective of changes in the quantities or variations in the Works or extensions in Time for Completion of the Works which are granted or agreed upon under the provisions of the Contract. In no case, the Performance Security shall be less than 10% of Contract Price or value of work increased due to variations and changes.

11.1 Inspection of Site

The following sub-clauses are further added;

- (i) The grounds and sub-surface conditions (so far as it is practicable) and having taken into account any information in connection therewith which may have been provided by or on behalf of the Employer, provided the Contractor shall make his own interpretation thereof,
- (ii) The form and nature of the Site,
- (iii) The extent and nature of the work and materials necessary for the completion of the work including their factual availability and reached at site costs at the bid submission stages,
- (iv) The means of communication and access to the Site,

12.2 Not Foreseeable Physical Observation or Conditions

This Sub-Clause is deleted and the following is substituted therefore:

If however during the execution of the works, the Contractor encounters artificial obstructions or physical conditions, other than climatic conditions or conditions due thereto, on the site, which obstructions or conditions could not, in his opinion, have been reasonably foreseen by

Seal and Signature of Bidder M/S _____

an experienced contractor, the Contractor shall forthwith give notice thereof to the Engineer with a copy of the Employer, and if the Contractor is of the opinion that additional costs will be incurred as a result thereof, he shall, if he intends to make any claim for additional payment, shall give notice to the Engineer with a copy to the Employer specifying the artificial obstructions or physical conditions encountered, details or the anticipated effects thereof, the measures he is taking or proposing to take, together with an estimate of the costs thereof and the extent of the anticipated delay or interference with the execution of the works. Following receipt of such notice, the Engineer may, inter alia:

Approve in writing such measures with or without modification, give written instructions as to how the artificial obstructions or physical conditions are to be dealt with.

Add the following sub-clause.

- 12.3** No claim for additional costs in respect of artificial obstructions or physical conditions shall be entertained unless notice as above mentioned has been served within the time specified in Clause 53.1.
- 12.4** To the extent that the Engineer is of the opinion that the whole or part of the aforesaid physical conditions or artificial obstruction could not reasonably have been foreseen by an experienced Contractor, the Engineer shall, after due consultation with the Employer and the Contractor, determine:

Any extension of time to which the Contractor is entitled under Clause 44, and the amount of any costs which may have been reasonably incurred by the Contractor by reason of encountering such conditions or obstructions and to which the Contractor is entitled.

13.1 work to be in Accordance with Contract

Add the following sentence at the end of paragraph.

“subject to the limit of the authority conferred on them in accordance with Sub-Clause 2.3 and 2.4, the Engineer’s Representative and his Assistants”:

Add the following sub-clause.

- 13.2** If the contractor is of the opinion that any instruction by the Engineer under the Clause is such as would entitle him to additional payment on the grounds that such instruction is not within the purview of the Contract cannot be reconciled with its expressed or implied terms unless it is considered as a variation of the Contract, then, without prejudice to the obligation of the Contractor to comply with such instruction, the Contractor shall, immediately upon receipt of same, give notice to the Engineer with a copy to the Employer of his intention to claim additional payment and furnish, within 28 days from the date of issue of the instruction in question, particulars of such claim. Should the Contractor fail to comply with these requirements, he shall be deemed to have waived any claim arising from such instruction of the Engineer.

14.1 Programme to be submitted

The programme shall be submitted within 21, days from the date of receipt of Letter of Acceptance, which shall be in the form of:

- i) A Bar Chart identifying the critical activities or
- ii) A CPM identifying the critical path/activities.

Duly prepared in M/S Prima Vera or M/S Project as approved by the Engineer.

Seal and Signature of Bidder M/S_____

14.3 Cash Flow Estimate to be submitted.

The detailed Cash Flow Estimate shall be submitted within 21 days from the date of receipt of Letter of Acceptance.

The following Sub-Clauses 14.5 & 14.6 are added:

14.5 Detailed Programme and Progress Reports

a) For purposes of Sub-Clause 14.1, the Contractor shall submit to the Engineer detailed programme for the following:

- (1) Execution of Works;
- (2) Labour Employment;
- (3) Local Material Procurement;
- (4) Material Imports, if any;
- (5) Details of fittings/fixtures; and
- (6) Other details as required by the Engineer.

(b) During the period of the Contract, the Contractor shall submit to the Engineer not later than the 8th day of the following month, 06 (six) copies of Monthly Progress Reports covering;

- (1) A Construction Schedule indicating the monthly progress in percentage;
- (2) Description of all work carried out since the last report;
- (3) Description of the work planned for the next 56 days sufficiently detailed to enable the Engineer to determine his programme of inspection and testing;
- (4) Monthly summary of daily job record;
- (5) Photographs to illustrate progress; and
- (6) Information about problems and difficulties encountered, if any, and proposals to overcome the same.

14.6 Daily Program and Progress Report

During the period of the Contract, the Contractor shall keep a daily record of the work progress in shape work dairy book, which shall be submitted to the Engineer on daily basis for verification and signature. The daily record shall include particulars of weather conditions, number of men working, deliveries of materials, quantity, location and assignment of Contractor's equipment (on the format duly approved by the Engineer/Employer). Three copies of daily progress duly verified by the Engineer shall be submitted to the Employer either work is carried out in preceding days or not, along with program of daily visits/checks to be made by the engineer.

The following Sub-Clauses 15.2 and 15.3 are added:

15.2 Language Ability of Contractor's Representative

The Contractor's authorized representative shall be fluent in the English language. Alternately an interpreter with ability of English language shall be provided by the Contractor on full time basis.

15.3 Contractor's Representative

- a) The Contractor's authorised representative and his other professional engineers working at Site shall register themselves with the Pakistan Engineering Council.
- b) The Contractor's authorized representative at Site shall be authorized to exercise adequate administrative and financial powers on behalf of the Contractor so as to achieve completion of the Works as per the Contract.

Seal and Signature of Bidder M/S_____

- c) Power of attorney shall be submitted to the employer as per format provided in the bidding/contract documents.

The following Sub-Clauses 16.3 and 16.4 are added:

16.3 Language Ability of Superintending Staff of Contractor

A reasonable proportion of the Contractor's superintending staff shall have a working knowledge of the English language. If the Contractor's superintending staff are not fluent in English language, the Contractor shall make competent interpreters available during all working hours in a number deemed sufficient by the Engineer.

16.4 Employment of Local Personnel

The Contractor is encouraged, to the extent practicable and reasonable, to employ staff and labour from sources within Pakistan especially from KPK.

The following Sub-Clauses 19.3 and 19.4 are added:

19.3 Safety Precautions

In order to provide for the safety, health and welfare of persons, and for prevention of damage of any kind, all operations for the purposes of or in connection with the Contract shall be carried out in compliance with the Safety Requirements of the Government of Pakistan with such modifications thereto as the Engineer may authorise or direct and the Contractor shall take or cause to be taken such further measures and comply with such further requirements as the Engineer may determine to be reasonably necessary for such purpose.

The Contractor shall make, maintain and submit reports to the Engineer concerning safety, health and welfare of persons and damage to property, as the Engineer may from time to time prescribe.

19.4 Lighting Work at Night

In the event of work being carried out at night, the Contractor shall at his own cost, provide and maintain such good and sufficient light as will enable the work to proceed satisfactorily and without danger. The approaches to the Site and the Works where the night-work is being carried out shall be sufficiently lighted. All arrangement adopted for such lighting shall be to the satisfaction of the Engineer/Engineer's Representative.

- 20.2** The words "rectify such loss or damages so that the Permanent Works conform" appearing in the fourth and fifth lines, are deleted and the following is substituted therefore.

"Repair and make good the same, so that, at completion, the Permanent Works shall be in good order and condition and in conformity."

20.4 Employer's Risks

The Employer's risks are:

Delete the text and substitute with the following:

- (a) insofar as they directly affect the execution of the Works in Pakistan:
- (i) war and hostilities (whether war be declared or not), invasion, act of foreign enemies,
 - (ii) rebellion, revolution, insurrection, or military or usurped power, or civil war,

Seal and Signature of Bidder M/S_____

- (iii) ionizing radiations, or contamination by radioactivity from any nuclear fuel, or from any nuclear waste from the combustion of nuclear fuel, radioactive toxic explosive or other hazardous properties of any explosive nuclear assembly or nuclear component thereof,
 - (iv) pressure waves caused by aircraft or other aerial devices travelling at sonic or supersonic speeds,
 - (v) Riot, commotion or disorder, unless solely restricted to the employees of the Contractor or of his Subcontractors and arising from the conduct of the Works;
- (b) Loss or damage due to the use or occupation by the Employer of any Section or part of the Permanent Works, except as may be provided for in the Contract;
- (c) loss or damage to the extent that it is due to the design of the Works, other than any part of the design provided by the Contractor or for which the Contractor is responsible; and
- (d) any operation of the forces of nature (insofar as it occurs on the Site) which an experienced contractor:
- (i) could not have reasonably foreseen, or
 - (ii) could reasonably have foreseen, but against which he could not reasonably have taken at least one of the following measures:
 - (a) prevent loss or damage to physical property from occurring by taking appropriate measures, or
 - (b) insure against.

21.1 Insurance of Works and Contractor's Equipment

- (d) The Contractor shall insure with any one of the insurance companies approved for this purpose by the Employer. The insurance policies shall be in the joint names of the Employer, and the Contractor against all losses or damages as stated in the General Conditions of the Contract Part-I and as stated herein. Notwithstanding the responsibilities of the Contractor for indemnities and insurances as described in Sub-Clause 21 to 24 of the General Conditions of Contract Part-I, the Contractor before the commencing the work on site, shall discuss fully with the Engineer and the Employer the insurance coverage provided under any general policies which are to be applied to this contract to ensure that there is no contingencies left uncovered and to reduce, as far as practicable, duplication of coverage. Should any areas of omission be discovered that are not covered by definition of responsibilities set out in these conditions, the additions or reduction in premiums required to give such insurance coverage will be paid by the Contractor. Such policies shall be obtained by the Contractor with consent of the Employer.

The Contractor shall be responsible for deductibles and losses/ damages not covered by insurances other than the expected risks.

The insurance losses shall not affect the Employer's or the Contractor's rights and obligations under the Contract.

The Contractor shall be responsible for compliance by this sub-contractors of insurances specified in these sub-clauses. Before each sub-contractor starts work, the contractor shall provide the Employer proof that the sub-contractors(s) are covered by the insurances specified herein for the Contractor.

All policies shall state that:

- i. The Employer shall receive at least thirty (30) days written notice of intended cancellation or change affecting coverage.

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- ii. The Contractor is fully protected so as to provide full indemnity to Employer in respect of liability against losses or damages assumed by the Contractor under the Contract.
- iii. The inclusion of more than one insured shall not affect the rights of any other insured.
- iv. If a loss occurs the Contractor and the Employer shall be paid in relation of their share of the loss.
- v. The insurer has no subrogation right against any person, corporation, or organization including directors, officers, employees, servants against thereof which;
 - Is an insured under the policy or
 - Is controlled by, owned by, or associated with an insured, or
 - Is a sub-contractor on the works, or has, before or a loss occurs, been released from liability by an insured.

Hold harmless provisions; The Employer, the Engineer and the Contractor shall be indemnified against all losses.

Employer use or occupancy; If the Employer uses or occupies all or part of the works during the lift of the insurance policy, the Contractor shall ensure that the policy continues in full force and the Employer shall pay any resulting extra cost of insurance.

Loss Procedure; If a loss occurs the Contractor shall, on behalf of the Employer and himself negotiate the value of the loss with the insurer. Unless directed otherwise by the Engineer, when agreement is reached the Contractor shall repair all damages and the Employer shall pay him in accordance with the Engineer's Certificates for that part of the repairs which is the Employer's responsibility.

The provisions of this Sub-Clause 21.1(d) shall be applicable to other insurance covered by sub-clauses 22, 23 and 24 of General Conditions of the Contract Part-I.

(e) **Automobile Liability Insurance;**

The Contractor shall also provide automobile liability insurance of all licenced vehicles owned, hired and operated by the contractor and the risk insured shall be bodily injury, death of person and property damage or loss.

Minimum Limit; As indicated in Appendix 'A' to the form of the bid inclusive each occurrence.

- 21.2** (a) The Employer and the Contractor, from the start of work at the Site until the date of issue of the relevant Taking – Over Certificate in respect of the works or any section or part thereof, as the case may be, against all loss or damages from whatsoever cause arising, other than the risks stated in Clause 24, provided, however, that with respect to the Employer's risk defined in Paragraph (g) of Sub-Clause 20.4, such exclusion shall be limited to loss of or damage to any part of the works resulting from a cause solely due to a faulty design thereof provided by the Engineer, but shall not extend so any consequent loss of or damage to any other part of the works.

21.4 Exclusions

The text is deleted and substituted with the following;

There shall be no obligation for the insurances in Sub-Clause 21.1 to include loss or damage caused by the risks listed under Sub-Clause 20.4 Para (a) (i) to (iv).

The following Sub-Clause 25.2 is added:

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25.5 Insurance Company

The Contractor shall be obliged to place all insurances relating to the Contract (including, but not limited to, the insurances referred to in Clauses 21, 23 and 24) with either National Insurance Company of Pakistan or any other insurance company operating in Pakistan and acceptable to the Employer.

Costs of such insurances shall be borne by the Contractor.

The following Sub-Clause 31.3 is added:

31.3 Co-operation with other Contractors

During the execution of the Works, the Contractor shall co-operate fully with other contractors working for the Employer at and in the vicinity of the Site and also shall provide adequate precautionary facilities not to make himself a nuisance to the residents of the University, local residents and other contractors.

32.1 Contractor to Keep Site Clear

The following paragraph is added at the end;

The contractor shall ensure cleanliness of roads of campus and shall engage labour for cleaning of roads on daily basis. In case of non-compliance, the employer shall engage the labour at the risk and cost of contractor for the said purpose.

The following Sub-Clauses 34.2 to 34.12 are added:

34.2 Rates of Wages and Conditions of Labour

The Contractor shall pay rates of wages and observe conditions of labour not less favourable than those established for the trade or industry where the work is carried out. In the absence of any rates of wages or conditions of labour so established, the Contractor shall pay rates of wages and observe conditions of labour which are not less favourable than the general level of wages and conditions observed by other employers whose general circumstances in the trade or in industry in which the Contractor is engaged are similar.

The contractor shall keep a record of attendance of labour and payment of their wages. During performance of contract or before release of final retention money if it was found that the contractor is failing to pay wages of labour duly employed by the contractor and proved by witness then the Employer upon the recommendation of the Engineer may pay the same duly deducting from the monies of the contractor. However this clause shall not entitles the labour to sue against the Engineer or the Employer for receiving any such payment or dues as this is only facilitation clause.

34.3 Employment of Persons in the Service of Others

The Contractor shall not recruit his staff and labour from amongst the persons in the services of the Employer or the Engineer; except with the prior written consent of the Employer or the Engineer, as the case may be.

34.4 Housing for Labour

Save insofar as the Contract otherwise provides, the Contractor shall provide and maintain such housing accommodation and amenities as he may consider necessary for all his supervisory staff and labour, employed for the purposes of or in connection with the Contract including all fencing, electricity supply, sanitation, cookhouses, fire prevention, water supply

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and other requirements in connection with such housing accommodation or amenities. On completion of the Contract, these facilities shall be handed over to the Employer or if the Employer so desires, the temporary camps or housing provided by the Contractor shall be removed and the Site reinstated to its original condition, all to the approval of the Engineer.

34.5 Health and Safety

Due precautions shall be taken by the Contractor, and at his own cost, to ensure the safety of his staff and labour at all times throughout the period of the Contract. The Contractor shall further ensure that suitable arrangements are made for the prevention of epidemics and for all necessary welfare and hygiene requirements.

34.6 Epidemics

In the event of any outbreak of illness of an epidemic nature, the Contractor shall comply with and carry out such regulations, orders and requirements as may be made by the Government, or the local medical or sanitary authorities, for purpose of dealing with and overcoming the same.

34.7 Supply of Water

The Contractor shall, so far as is reasonably practicable, having regard to local conditions, provide on the Site, to the satisfaction of the Engineer or his representative, adequate supply of drinking and other water for the use of his staff and labour.

34.8 Alcoholic Liquor or Drugs

The Contractor shall not, otherwise than in accordance with the Statutes, Ordinances and Government Regulations or Orders for the time being in force, import, sell, give, barter or otherwise dispose of any alcoholic liquor or drugs, or permit or suffer any such importation, sale, gift, barter or disposal by his Subcontractors, agents, staff or labour.

34.9 Arms and Ammunition

The Contractor shall not give, or otherwise dispose of to any person or persons, any arms or ammunition of any kind or permit or suffer the same as aforesaid.

34.10 Festivals and Religious Customs

The Contractor shall in all dealings with his staff and labour have due regard to all recognized festivals, days of rest and religious and other customs.

34.11 Disorderly Conduct

The Contractor shall at all times take all reasonable precautions to prevent any unlawful, riotous or disorderly conduct by or amongst staff and labour and for the preservation of peace and protection of persons and property in the neighborhood of the Works against the same.

34.12 Compliance by Subcontractors

The Contractor shall be responsible for compliance by his Subcontractors of the provisions of this Clause.

The following Sub-Clauses 35.2 and 35.3 are added:

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35.2 Records of Safety and Health

The Contractor shall maintain such records and make such reports concerning safety, health and welfare of persons and damage to property as the Engineer may from time to time prescribe.

35.3 Reporting of Accidents

The Contractor shall report to the Engineer details of any accident as soon as possible after its occurrence. In the case of any fatality or serious accident, the Contractor shall, in addition, notify the Engineer immediately by the quickest available means.

36.2 Cost of Samples

Sample of all fittings, fixtures and other items shall be provided, supplied under the contract by the Contractor free of cost. Samples shall be submitted to the Engineer for approval and shall be retained in the office of the Engineer up to the completion. Cost of samples shall be deemed included in the quoted rates by the Contractor.

The following Sub-Clause 36.6 is added:

36.6 Use of Pakistani Materials and Services

The Contractor shall, so far as may be consistent with the Contract, make the maximum use of materials, supplies, plant and equipment indigenous to or produced or fabricated in Pakistan and services, available in Pakistan provided such materials, supplies, plant, equipment and services shall be of required standard.

The contractor shall be responsible to procure all the material from the legal sources and in legal way. The wood in particular shall be procured from the legal source as per Forest Act. The contractor shall provide the voucher/invoices/gate pass etc. as a proof of purchase from legal source to the Engineer and Employer during process of bills.

37.1 Inspection of Operations

In the first line after the word "Engineer" add " and the Employer".

37.4 Rejection

In the eight line after the words "if the Engineer so requests," add "from the Employer and the Employer approves so, then".

38.2 Uncovering and Making Openings

This Sub-Clause is deleted and the following substituted therefore:-

The Contractor shall uncover any part or parts of the works, or make openings in or through the same as the Engineer may from time to time instruct and shall reinstate and make good such part or parts to the satisfaction of the Engineer. If any such part or parts have been covered up or put out of view after compliance with the requirements of Sub-Clause 38.1 and are found to be executed in accordance with the Contract, the Engineer shall, after consultation with the Employer and the Contractor, determine the amount of Contractor's costs in respect of such uncovering, making openings in or through, reinstating and making good the same, provided that the Contractor has, upon receipt of the Engineer's order, and in any Engineer and the Employer of his intention to claim such expenses. In any other case all costs shall be borne by the Contractor.

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- 40.3** (1) The words “an event of default” appears in the 11th line of the Sub-Clause are deleted and the words “a repudiation of the Contract” are substituted therefore.

41.1 Commencement of Works

The text is deleted and substituted with the following:

The Contractor shall commence the Works on Site within the period named in Appendix-A to Bid from the date of receipt by him from the Engineer of a written Notice to Commence. Thereafter, the Contractor shall proceed with the Works with due expedition and without delay.

42.1 Possession of Site Access Thereto

Project Director Shaheed BB University Sheringal, Dir Upper shall hand over the possession of site to the contractor.

44.1 Extension of Time for Completion

Add the following Para at the end of Clause.

Engineer shall recommend the extension of time to the Employer and upon approval from the Employer, the Engineer shall notify to the Contractor.

46.1 Rate of Progress

Add the following Para at the end of Clause.

The supervision charges of the Consultants, Engineer, and other supervisory staff as the case may be, in the extended time allowed to the Contractor shall be deducted from the contractor.

The following Sub-Clause 47.3 is added:

47.3 Interim Liquidated Damages

The Contractor shall carry out work at site according to approved programme (work schedule) & shall update the work schedule as per requirement of the Engineer. Progress at site if found consistently behind the schedule in the two consecutive quarters, interim liquidated damages shall be implemented at half rate of liquidated damages as mentioned in appendix-A to bid, which may be refunded if the progress again matches the approved work schedule any time during the currency of the works.

49.3 Cost of Remedying Defects

The following sub-clause 49.3 (d) is added.

49.3(d) or not following the instruction of the Engineer given in writing to the Contractor.

51.2 Instructions for Variations

At the end of the first sentence, after the word “Engineer” the words “ in writing, with a copy to the Employer” are added.

52.1 Valuation and Variations

In the tenth line, after the words “Engineer shall” the following is added: Within a period not exceeding one-eighth of the completion time subject to a minimum of 56 days from the date of disagreement whichever is later.

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And further add:

For the purpose of valuation of VO, where rates are not available in the priced BoQ, then the Rates of MRS-2017 (CSR KP) shall be applied along with %age \pm premium or discount as the case may be, offered by the bidder/contractor and approved by the Employer. In case of non-availability of required rates in MRS, analysis of rates shall be done by the Engineer as per General Engineering practice i.e original expenditures of materials and labour, adding 10% Contractor's Profit, and 5% Overhead Charges. (and 7% Withholding Tax, if applicable, to the contractor). It is further added that the descriptions of MRS are abbreviated and shall be referred to Rate Analysis of MRS and Detailed Description of CSR attached with CSR-1999. The Engineer shall accord approval of the Employer for variations before notifying to the Contractor.

52.2 Power of Engineer to Fix Rates

The BoQ is priced on MRS/CSR of Khyber Pakhtunkhwa hence the items rate as well premium or discount as the case may be, offered by the bidder/contractor and approved by the Employer shall be fixed without any change during the currency of the Contract.

53.4 Failure to Comply

This Sub-Clause is deleted in its entirety.

54.5 Conditions of Hire of Contractor's Equipment

The following paragraph is added:

The Contractor shall, upon request by the Engineer at any time in relation to any item of hired Contractor's Equipment, forthwith notify the Engineer in writing the name and address of the Owner of the equipment and shall certify that the agreement for the hire thereof contains a provision in accordance with the requirements set forth above.

The following Sub-Clauses 59.4 and 59.5 are added:

59 Nominated Subcontractors

Clause 59 is deleted in its entirety.

60.1 Monthly Statements

In the first line after the word "shall", the following is added:

"On the basis of the joint measurement of work done under Clause 56.1,"

In Para (c) the words "the Appendix to Tender" are deleted and substituted with the words "Sub-Clause 60.11 (a) (6) hereof".

60.2 Monthly Payment

In the first line, " 28" is substituted by "14".

60.3 Payment of Retention Money

The following Sub-Clause 60.3 (c) is added.

60.3(c) provided that external audit department has completed the audit and any recovery decided by public accounts committee is recovered in the subject contract.

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60.10 Time for Payment

In the clause the text "In the event of the failure ----- or otherwise" is deleted and replaced with " in the event of failure of the Employer to make payment with in times stated, the Employer shall pay to the Contractor compensation at the 28 days rate of KIBOR+2% per annum, upon all sums unpaid from the date by which the same should have been paid. The provision of this sub-clause is without prejudice to the contractor's entitlement under Clause 69.

The following Sub-Clause 60.11 is added:

60.11 Secured Advance on Materials

- a) The Contractor shall be entitled to receive from the Employer Secured Advance against an indemnity bond acceptable to the Employer of such sum as the Engineer may consider proper in respect of non-perishable materials brought at the Site, but not yet incorporated in the Permanent Works provided that:
- (1) The materials are in accordance with the Specifications for the Permanent Works;
 - (2) Such materials have been delivered to the Site and are properly stored and protected against loss or damage or deterioration to the satisfaction of the Engineer but at the risk and cost of the Contractor;
 - (3) The Contractor's records of the requirements, orders, receipts and use of materials are kept in a form approved by the Engineer, and such records shall be available for inspection by the Engineer;
 - (4) The Contractor shall submit with his monthly statement the estimated value of the materials on Site together with such documents as may be required by the Engineer for the purpose of valuation of materials and providing evidence of ownership and payment therefore;
 - (5) Ownership of such materials shall be deemed to vest in the Employer and these materials shall not be removed from the Site or otherwise disposed of without written permission of the Employer; and
 - (6) The sum payable for such materials on Site shall not exceed 75 % of the
 - (i) Landed cost of imported materials, or
 - (ii) Ex-factory /ex-warehouse price of locally manufactured or produced materials, or
 - (iii) Market price of other materials.
- (b) The recovery of Secured Advance paid to the Contractor under the above provisions shall be effected from the monthly payments on actual consumption basis.

63.1 Default of Contractor

The following Para is added at the end of the Sub-Clause:

The works executed at the risk and cost of the defaulter contractor, either by the Employer directly or through another contractor, any sum incurred in excess, which would have been paid to original contractor, had the whole of the work been executed by him (of the amount of which excess, the certificate in writing of the Engineer shall be final and conclusive) shall be borne and paid by the defaulter contractor, and shall be deducted from any money due to the Employer under the Contract or otherwise, or from his security deposits or from the value of the performance security. The defaulter contractor shall have no claim to compensation for any loss sustained by him by reason of his having purchased or procured any materials, or

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enter into any engagement, or made any advances on account of, by with a view to, the execution of the works or the performance of the contract.

Provided further that in addition to the action taken by the Employer against the Contractor under this Clause, the Employer may also refer the case of default of the Contractor to Pakistan Engineering Council for punitive action under the Construction and Operation of Engineering Works Bye-Laws 1987, as amended from time to time.

65.2 Special Risks

The text is deleted and substituted with the following:

The Special Risks are the risks defined under Sub- Clause 20.4 sub-paragraphs (a-i) to (a-v) of PCC.

65.6 Out Break of War

In Sub-Clause 65.6, delete the text " in any part of the world" from the second line of the paragraph.

67.2 Amicable Settlement

The Employer and Contractor may agree to constitute *Dispute Adjudication Board (DAB)* as per FIDIC guidelines prior to arbitration proceeding on a particular dispute on ad-hoc basis or for dispute(s) permanently with the mutual consent of both parties.

67.3 Arbitrations

In the sixth to eight lines, the words "shall be finally settled.... appointed under such Rules" are deleted and substituted with the following:

Shall be finally settled under the provisions of the Arbitration Act, 1940 as amended or any statutory modification or re-enactment thereof for the time being in force.

The following paragraph is added:

The place of arbitration shall be Sheringal, Dir Upper Khyber Pakhtunkhwa, Pakistan.

68.1 Notice to Contractor

The following paragraph is added:

For the purposes of this Sub-Clause, the Contractor shall, immediately after receipt of Letter of Acceptance, intimate in writing to the Employer and the Engineer by registered post, the address of his principal place of business or any change in such address during the period of the Contract.

68.2 Notice to Employer and Engineer

For the purposes of this Sub-Clause, the respective addresses are:

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The Employer;

The Vice Chancellor
Shaheed Benazir Bhutto University,
Sheringal, Dir Upper.

The Engineer:

General Manager
M/S ACE (Pvt.) Ltd. (Arts Section)

Employer's Representative:

Project Director,
Shaheed Benazir Bhutto University
Sheringal, Dir Upper

Engineer's Representative:

Resident Engineer
M/S ACE (Pvt.) Ltd.

Or any person/firm/authority nominated from time to time by the Employer.

70.1 Increase or Decrease of Cost

Sub-Clause 70.1 is deleted in entirety.

The contract is fixed priced contract, hence no-price adjustment (increase or decrease in cost) shall be made.

The following sub-clauses are added.

73.1 Payment of Income Tax

The Contractor, Subcontractors and their employees shall be responsible for payment of all their income tax, super tax and other taxes on income arising out of the Contract and the rates and prices stated in the Contract shall be deemed to cover all such taxes, except in case where the contractor has produced tax exemption certificate at the time of bidding.

It is to clarify that pricing of Bill of Quantities is done adopting rates of MRS/CSR of Khyber Pakhtunkhwa, where the rates are based on the rate analysis duly available on the official website of Govt. of Khyber Pakhtunkhwa. The Rate Analysis are done as per Engineering Practice i-e original cost of material and labour adding 10% as contractor's profit, 5% as overhead charges of the contractor further for payment of withholding tax by the contractor to the Govt. 7% is added to each item of MRS/CSR. As some area of the country and province is exempted from tax, hence Finance department of Govt. of Khyber Pakhtunkhwa wide Notification No.SO (Dev-II)/FD/12-6/2014-15 dated 21/04/2015 it was directed that Engineer's while preparation of estimate for the area pertaining to tax exempted shall frame the estimates with 7% less cost to defray the amount added in the rate analysis to meet withholding tax. Hence the same is deducted from the estimate and shall not be payable to the contractors pertaining to tax exempted area. The contractors not pertaining to tax exempted area shall be dealt with as per practice in the other area of the country as the 7% shall not be deducted from the estimate so that deduction could be made from the bills and could be paid to the tax authorities.

73.2 Customs Duty & Taxes

The contract price shall be deemed to include every element of duty or tax leviable on or in relation to the production, import, purchase, sale, delivery and transportation of materials and to the bringing thereof to the site and no such duty or tax shall be separately reimbursable.

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74.1 Integrity Pact

If the Contractor or any of his Subcontractors, agents or servants is found to have violated or involved in violation of the Integrity Pact signed by the Contractor as Appendix to his Bid, then the Employer shall be entitled to:

- i. recover from the Contractor an amount equivalent to ten times the sum of any commission, gratification, bribe, finder's fee or kickback given by the Contractor or any of his Subcontractors, agents or servants;
- ii. terminate the Contract; and
- iii. Recover from the Contractor any loss or damage to the Employer as a result of such termination or of any other corrupt business practices of the Contractor or any of his Subcontractors, agents or servants.

The termination under Sub-Para (b) of this Sub-Clause shall proceed in the manner prescribed under Sub-Clauses 63.1 to 63.4 and the payment under Sub-Clause 63.3 shall be made after having deducted the amounts due to the Employer under Sub-Para (a) and (c) of this Sub-Clause.

75.1 Termination of Contract for Employer's Convenience

The Employer shall be entitled to terminate the Contract at any time for the Employer's convenience after giving 56 days prior notice to the Contractor, with a copy to the Engineer. In the event of such termination, the Contractor:

- (a) Shall proceed as provided in Sub-Clause 65.7 hereof; and
- (b) Shall be paid by the Employer as provided in Sub-Clause 65.8 hereof.

76.1 Liability of Contractor

The Contractor or his Subcontractors or assigns shall follow strictly, all relevant labour laws including the Workmen's Compensation Act and the Employer shall be fully indemnified for all claims, damages etc. arising out of any dispute between the Contractor, his Subcontractors or assigns and the labour employed by them.

77.1 Joint and Several Liabilities

If the Contractor is a joint venture of two or more persons, all such persons shall be jointly and severally bound to the Employer for the fulfilment of the terms of the Contract and shall designate one of such persons to act as leader with authority to bind the joint venture. The composition or the constitution of the joint venture shall not be altered without the prior consent of the Employer.

78.1 Details to be Confidential

The Contractor shall treat the details of the Contract as private and confidential, save in so far as may be necessary for the purposes thereof, and shall not publish or disclose the same or any particulars thereof in any trade or technical paper or elsewhere without the prior consent in writing of the Employer or the Engineer. If any dispute arises as to the necessity of any publication or disclosure for the purpose of the Contract, the same shall be referred to the decision of the Engineer whose award shall be final.

79.1 Particular Conditions of the Contract (PCC)

The above provisions under Particular Conditions of the Contract (PCC) shall complement, amend, or supplement the provisions of the General Conditions. Wherever there is a conflict, the provisions herein above shall prevail over those in the General Conditions.

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SPECIFICATIONS SPECIAL PROVISIONS (SP)

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SPECIFICATIONS - SPECIAL PROVISIONS

1. GENERAL

- 1.1 Specifications – Special Provisions shall form an integral part of Bid & Contract documents.
- 1.2. The Contractor shall notify all sub-contractors of the provisions of these Special Provisions.

2. DESCRIPTION OF PROJECT WORKS INVOLVED AND SITE

- 2.1 The sponsoring agency, has issued an Administrative Approval for the project and funding shall be done accordingly.
- 2.2 The proposed project envisages herein this Contract shall be the “**Construction of Multipurpose Hall**”, at SBBU Sheringal. The weather at Sheringal Dir Upper is moderate in summer and very cold in winter with November to January as snowfall period. However, constructors are advised to have relevant data of the weather from the concerned meteorological department.
- 2.3 The Employer will give to the Contractor possession of the area designated and defined as “the Site” on the drawing or as may be required to implement the Works.

3. CODES, STANDARDS AND CERTIFICATES

A. Applicable Standards

Except as otherwise provided by these Specifications or the Drawings, all materials, equipment and fabrication and testing thereof shall conform to the latest applicable standards and codes referred in the Specifications by use of the abbreviations explained below:

ACI	- American Concrete Institute (USA)
AISI	- American Iron and Steel Institute (USA)
AISC	- American Institute of Steel Construction (USA)
ANSI	- American National Standard Institute (USA)
ASTM	- American Society for Testing and Materials (USA)
AASHTO	- American Association of State Highway & Transportation Officials.
AWS	- American Welding Society (USA)
BS	- British Standards (UK)
CP	- Codes of Practice (UK)
PS	- Pakistan Standards (Pak)
SSPC	- Steel Structures Painting Council (USA)
UBC	- Uniform Building Code (USA)
USBR	- United States Bureau of Reclamation (USA)
ASA	- American Standard Association
ASCE	- American Society of Civil Engineers.
ICAO	- International Civil Aviation Organization
BSICP	- British Standard Institute Code of Practice
PCA	- Portland Cement Association
PSQCA	- Pakistan Standard & Quality Control Authority.

If the Contractor, at any time and for any reason, wishes to deviate from the above standards or desires to use material or equipment not covered by the above standards, he shall state the exact nature of the changes, the reason for making the change and shall submit complete specifications of the materials and equipment to the Engineer for approval.

B. Standards other than those Specified

Where requirements for materials or equipment are specified by reference to a standard which has its origin in one country, it is not the intention to restrict the requirements solely to that

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standard and that country. Other standards, including standards of other countries, will be accepted provided the requirements thereof, in the sole opinion of the Engineer are at least equal to the requirements of the standard specified. The Contractor may propose to the Engineer an equivalent standard other than that specified, in which case he shall submit the proposed standard and all other information required and shall submit written proof that his proposed standard is equivalent in all significant respects to the standard specified. All submissions must be made in the English language.

C. Codes and Standards at Site

The Contractor shall supply and have at his site office:-

- a) Copies of all latest editions of codes and standards referred to in these Specifications or equivalent codes and standards as approved by the Engineer.
- b) Catalogues and published recommendations from manufacturers supplying products and materials for the project.
- c) The Contractor shall provide manufacturer's or supplier's materials which must meet the requirements of a specific code or standard as stated in these Specifications.

4. MANUFACTURER'S RECOMMENDATIONS

Installation of manufactured items shall be in accordance with procedures recommended by the manufacturer or as approved by the Engineer.

5. UNITS OF MEASUREMENTS

As far as possible the Metric System of Units shall be adopted along with FPS system. However, keeping in view the local practices, knowledge, experiences and capabilities of the Contractor skilled/unskilled staff and materials availability, the Imperial System (FPS System) of Units (i-e British system) has been used in the drawings and pricing BoQ and the same will be adopted in the entire project.

6. PLANT, EQUIPMENT AND TOOLS

The Contractor shall provide at his own cost, modern plant, including batching plant for concrete work equipment and tools which are adequate and benefitting to the nature, magnitude and size of contracted Works, in strict compliance with the requirements of the General Conditions of Contract, Conditions of Particular Applications and Technical Specifications.

7. STORAGE & HANDLING FACILITIES

The Contractor shall make his own arrangements for providing the necessary space for the storage of plant, equipment, materials and for his temporary office, in and around the site of works, during the currency of the Contract.

8. FIELD LABORATORY AND TESTING

8.1 General

The Contractor shall provide and maintain a field laboratory well equipped with approved equipment to perform all tests that shall be required by the Engineer for quality assurances. These tests shall be performed by Contractor's competent personnel in accordance with quality control programme as established by the Contractor and approved by the Engineer. If the Engineer so desires, the Contractor shall at his own cost, facilitate performing of certain

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tests in any other laboratory as designated by the Engineer.

The Contractor shall employ qualified material Engineer, Technicians and helpers for managing the laboratory activities and shall provide any assistance, from time to time or whenever required by the Engineer for testing purposes.

The Field Laboratory, including all equipment and technical staff shall be placed at the disposal and direction of the Engineer during the entire period of the Contract.

The Contractor shall keep a complete record of all quality tests performed at site.

All quality control tests shall be carried out in accordance with applicable Standards and Codes.

8.2 Field Laboratory Equipment Requirements

The Laboratory shall be well equipped with new, unused and latest Equipment to perform tests as per Technical Specifications and General Conditions of Contract. Additional equipment/materials shall be supplied by the Contractor as and when required by the Engineer to perform any specified test, at no additional cost to the Employer.

The laboratory shall also be equipped with new, unused furniture, fittings and fixtures. If any equipment, furniture, fitting or fixture becomes unserviceable for any reason what so ever, the Contractor shall promptly replace the same as and when directed by the Engineer.

8.3. Testing Laboratory Certificates

The Engineer may accept a certificate from a commercial testing laboratory, satisfactory to him, certifying that the product has been tested within a period acceptable to the Engineer and that it conforms to the requirements of these specifications.

8.4. Method of Payment

The cost of providing, running and maintenance of the laboratory, equipment, materials and staff, testing charges for materials to be supplied by the Contractor and all other tests to be performed in any other laboratory designated by the Engineer shall be deemed to be included in the rates, prices, %age, premium, discounts quoted by the Contractor and no separate claim for payment on this account shall be entertained by the Engineer.

In case the Contractor does not provide the specified equipment and testing facility, then the same shall be done from the approved labs such as UET lab etc. and payment made to such labs along with 40% overhead and shall be deducted/ recovered from the Contractor's bills.

9. SURVEYING INSTRUMENTS

9.1 General

The minimum quantity of survey equipment is stated below which shall be available with the Contractor at site of Works along with qualified Surveyors and Survey Helper. The equipment shall be maintained throughout the Contract Period and replaced by the Contractor in case of damage or loss. The survey equipment shall be made available to the Engineer when directed. All surveying equipment shall be in excellent working conditions.

9.2 Surveying Equipment Required

The Contractor shall provide and maintain the following surveying equipment at site.

- | | | |
|------|---|--------|
| i. | Electronic Total Station with accessories | 1 No. |
| ii. | Steel measuring tapes 30 m long | 2 Nos. |
| iii. | Steel measuring tapes 6 m long | 2 Nos. |

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- iv. All other miscellaneous tools, equipment and materials required in surveying.

10. APPROVAL OF MATERIALS AND PLANT

10.1 Quality of Materials

All materials, fixtures, fittings, supplies and plant to be furnished under the Contract shall be new and conforming to standards of first grade quality both in-terms of workmanship and design. No inferior or low-grade materials, supplies or articles shall either be approved or accepted. All permanent Works, whether of installation, assembly or of construction as envisaged under the Contract shall be performed in a first-class and workmanlike manner. While asking for prices for materials intended for delivery to the site and incorporation in the Works under any portion of these Specifications, the Contractor shall provide the manufacturer or supplier with complete information as may be necessary to secure compliance to this Clause and, in every case, he shall quote this Clause in full to each such manufacturer or supplier.

10.2 Submission of Samples and Data

- 10.2.1 The Contractor shall furnish for approval of the Engineer with reasonable promptness all samples as directed by the Engineer or specifically called for in the Specifications and in accordance with the time schedule provided in the schedule of submittals. The Engineer shall check and approve such samples with reasonable promptness only for conformance with the design concept of the Works and for compliance with the information given in the Contract Documents. All work shall be in accordance with approved samples.
- 10.2.2 Samples shall be furnished so as not to delay fabrication, allowing the Engineer reasonable time for consideration of the sample submitted.
- 10.2.3 Each sample shall be properly labeled with the name and quality of the material, manufacturer's name, name of the project, the Contractor's name and the date of submission, and the Specifications Article number to which the sample refer.
- 10.2.4 The manufacturer's installation directions shall be provided with each sample. The Contractor shall pay all transportation costs and deliver samples to the Engineer's office, Site or testing laboratory as directed by the Engineer.
- 10.2.5 Samples shall be of adequate size to permit proper evaluation of the material by the Engineer. Where variations in colour, texture, dimensions or other characteristics are to be expected, the Contractor shall submit samples showing the maximum range of variation. Materials exceeding the range of variation of the approved samples shall not be used on the Work.
- 10.2.6 In order to permit coordinated selection of colours and finishes, the Contractor shall deliver samples of all related items to the Engineer at one time. Samples of such materials shall not be approved until all related samples have been submitted.
- 10.2.7 If both Shop Drawings and samples are required for the same item, the Engineer may require both to be submitted before approving either.
- 10.2.8 The Contractor shall erect Mock-up samples of finished items (such as wooden/aluminum doors/windows/ventilators, all exterior/interior finishes including tile work, concrete pre-cast elements like jali/grill work, false ceiling, etc.) where specifically called for in the documents or as directed by the Engineer.
- The Mock-up samples shall be preserved/protected by the Contractor till the end of the project or as directed by the Engineer.
- 10.2.9 No acceptance or approval of any Shop Drawings or sample, or any indication or request by the Engineer on any Shop Drawings shall constitute an authorization for any increase in the

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10.3 Inspections

All material and Plant furnished and all work performed under this Contract will be subject to inspection by the Engineer at all times and in all states of completion both off-Site and on-Site. The Contractor shall furnish promptly without additional charge, all facilities, transportation, travelling, boarding, lodging, labour and materials reasonably needed for performing such inspection and testing as may be required by the Engineer.

10.4 Approved Sample at Site

The Contractor shall, at all times, keep on the Site approved samples. All such samples shall be made available to the Engineer as and when required.

11. BAR BENDING SCHEDULE

Bar bending schedule (of reinforcement bars) of all structural drawings shall be prepared by the Contractor and submitted in triplicate to the Engineer for approval. Copies of the same shall be returned to Contractor with a copy to the Employer.

12. DRAWINGS

12.1 Bid Drawings

Bid Drawings issued with the Bidding Documents, called the Bid Drawings, showing general scope of the work to be performed by the Contractor. The Drawings are generally in sufficient detail which may be used as a basis for construction, fabrication and for placing orders for materials subject to corrections based on the future issue of supplementary/ additional/ modified Drawings as provided under Sub-Clause 12.2 hereof.

12.2 Construction Drawings, Supplementary Drawings

After award of Contract, the Bid Drawings may become Construction Drawings.

The Engineer shall have authority to issue to the Contractor, from time to time, such supplementary additional/modified Drawings and instructions as shall be necessary for the purpose of the proper and adequate execution and completion of the Works and the remedying of any defects therein. The Contractor shall follow these drawings.

12.3 Definition of Term Drawings

The term Drawings as used in the Specifications means the Drawings referred in Clauses 12.1 and 12.2 above.

12.4 Checking of Drawings

The Contractor shall check all Drawings carefully as soon as practicable after receipt thereof, and shall promptly notify the Engineer of any errors discovered with a copy to the Employer.

12.5 Copies of Drawings

One (1) set of the Construction Drawings will be issued to the Contractor at the time of Construction free of charge. Additional sets will be provided at cost of reproduction upon written request of the Contractor.

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12.6 Drawings to be furnished by the Contractor

The Contractor shall submit to the Engineer for review, such drawings as are required under the Contract, sufficiently in advance of the work intended to be executed.

12.6.1 Reinforcement Drawings

Reinforcement placement drawings and bar bending schedules (to be provided by the Contractor as per clause above) of all RCC work shall be prepared by the Contractor and submitted in triplicate to the Engineer for approval, sufficiently in advance of the works in which they are intended to be used.

12.6.2 Shop Drawings

- (a) The Contractor shall submit to the Engineer for review three (3) copies of all drawings to be issued for setting out, fabrication, supply order and construction; based on data, requirements, dimensions, details, codes, standards and design provided in the drawings issued by the Engineer. Such drawings shall be submitted at least twenty-eight (28) days before they are required for use. The Engineer may notify the Contractor that a drawing fails to comply with the relevant requirement of the Contract, in which case the drawing shall be rectified and resubmitted for approval at the Contractor's cost. Fabrication or construction shall not commence on any part of the Works until the shop drawings or construction drawings for that part of the Works have been approved by the Engineer.

The Works shall be executed in accordance with the drawings as approved by the Engineer. If the Contractor wishes to modify any approved drawings, he shall immediately notify the Engineer and submit revised drawings for approval. If the Engineer instructs that further drawings are necessary for executing the Works, the Contractor shall prepare such drawings and submit them for approval.

The Contractor at his cost shall rectify errors, omission, ambiguities, inadequacies and other defects.

Approval by the Engineer, in accordance with this paragraph, shall not relieve the Contractor of any of his responsibilities under the Contract.

- (b) The shop drawings shall be properly identified indicating the part of the Works, the name of the contractor / supplier etc., the date of preparation and the dates of all revisions. The Shop Drawings shall be complete and shall show the design dimensions, proposed materials to be used, finishes, type of shop paint and all other details in connection thereto.
- (c) Where adjoining work requires shop drawings, the Contractor shall prepare and submit composite shop drawings, which shall show and define the work under all affected trades. If the Contractor executes work before coordinating with other trades so as to cause interference with work of those trades, he shall make changes necessary to correct the conditions without extra cost to the Employer.
- (d) No changes shall be made by the Contractor in the resubmitted shop drawings in excess of the corrections spelled out by the Engineer and in a separate note on the shop drawings.
- (e) No work in the shop shall be started and no material or plant ordered until the Engineer has approved the shop drawings. It shall be the responsibility of the Contractor to submit the shop drawings on a schedule that allows reasonable time for checking and approval and subsequent fabrication. Failure to submit shop drawings in ample time for checking, correcting, and rechecking will not justify extension of time for completion of the Works.
- (f) The Contractor shall also check and verify all site measurements whenever requested by other Specialist Contractors or by other Sub-Contractors to enable them to prepare their own shop drawings and pass on the information with sufficient promptness, so as not to delay the work in any way. A copy of all such information passed on shall be given to the Engineer.

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12.6.3 As-Built Drawings

The Contractor shall, at all times, keep on Site a separate set of prints of all drawings on which all significant changes between the work shown on the Drawings and that which is actually constructed, shall be noted neatly, accurately and promptly as the work progresses. For plumbing, mechanical and electrical works, a separate set of prints of the drawings (showing their parts of the Works) on which all significant changes between the work shown on the Drawings and that which is actually constructed, shall be noted neatly, accurately and promptly as the work progresses. Such drawings shall show the exact physical location and configuration of the works as actually installed.

The Contractor shall, within fourteen (14) days of issuance of Taking-Over Certificate for whole of the Works, furnish to the Engineer for his approval two (2) copies of such marked up drawings. One (1) copy of each of the marked up drawings approved by the Engineer shall be returned to the Contractor by the Engineer and these shall be used for the preparation of the As - Built Drawings.

The Contractor shall furnish to the Engineer six (6) complete sets and one reproducible copy of all As-Built Drawings along with soft copies within twenty eight (28) days of receipt of drawings stated above, from the Engineer.

13. PROTECTION OF THE WORKS

The Contractor shall whenever necessary cover up and protect the works from weather and damage by his own or other workmen performing subsequent operation. The Contractor shall provide all necessary dustsheets, barriers and guard rails and clear away the same at completion.

The Contractor shall take all proper steps for protection at all places on or about the works which may be dangerous to his workmen or any other person or to traffic. The Contractor shall provide and maintain warning signs, Warning Lamps and Barricades as necessary.

14. PRODUCT DATA

Manufacturer's standard schematic drawings shall be modified or deleted to indicate only information which is applicable to the project. Such standard information shall be supplemented to provide all additional applicable information.

Manufacturer's catalogue sheets, brochures, diagrams, schedules, performance charts, illustrations and other standard descriptive literature shall be clearly marked to identify pertinent materials product or models. Dimensions and required clearances shall be indicated. Shop performance characteristics and capacities shall be noted.

15. RESTORATION AND CLEANING

Upon completion of the works, the Contractor shall restore all items covered by the Contract to the satisfaction of the Engineer.

The Contractor shall do regular cleaning and clear away all rubbish and excess materials that may accumulate from time to time on completion and before handing over. Upon completion of the works he shall obliterate all signs of temporary construction facilities such as work areas, structures, foundations of temporary structures, stock piles of excess or waste materials, or any other vestiges of construction, as directed by the Engineer. All buildings shall be cleaned; floors and paving scrubbed and the works and site shall be left in a clean and satisfactory state for immediate use and occupation. Care shall be taken not to use any cleaning materials, which may cause damage to the surface to be cleaned.

The Contractor shall also take all necessary precautions to keep the works and site free from vermin during construction and he shall leave the works vermin free on completion. Application of pest control agents shall not commence until the specific product, name, method and extent of application have been submitted to and approved of by the Engineer.

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16. SITE OFFICES AND TEMPORARY FACILITIES TO BE PROVIDED BY CONTRACTOR.

16.1 Contractor's Office, Facilities Etc.

The Contractor shall establish and maintain Site office. The Contractor shall provide all facilities in connection with the execution, completion, of the Works, remedying defects therein and maintenance of the utilities services. The facilities shall not be limited to the Contractor's Site Office, labor camps, work yard and storage areas, temporary water supply, waste water disposal, temporary electricity, medical unit, temporary roads, fire protection and firefighting equipment etc. The Contractor shall be solely responsible for arranging all utilities and the Contractor shall setup, maintain and operate an architectural and engineering facility at sites with adequate number of technical and support staff as well as equipment required for particular nature of job covered under the Contract to prepare drawings/shop drawings for approval of the Engineer.

The Contractor shall arrange his labour camp, work yard, storage area and site offices within the site areas available at the sites.

16.2 Temporary Roads

The Contractor shall prepare and maintain such temporary roads as may be necessary, from the site to the nearest road and also within the plot. Such roads shall be positioned strictly in accordance with the Engineer's instructions and the Contractor shall reduce or control any dust nuisance by regularly spraying water and compaction as directed.

16.3 Temporary Services

16.3.1 Temporary Water Supply

The Contractor shall make his own arrangement for water resources necessary potable and other water for construction purposes for all trades at least three (3) points at different locations within the site and from where the Contractor shall take-off the piping at the desired location of construction. The Contractor shall make his own arrangements and pay charges for water service installation, maintenance and removal thereof, and pay the costs of water for all trades at rates mutually agreed with the Employer to the concerned local agency.

The Employer upon the recommendation of the Engineer may provide water available extra with Employer to the Contractor if he so requests through the Engineer. The Contractor shall construct tanks and other reservoir for storage as well as shall make necessary arrangement of piping etc. The water may be supplied in night time by the Employer for storage by the Contractor. Monthly deduction of Rs. 5000/- per month in lump sum shall be made from the bills of the Contractor.

At completion of the work, the temporary water services equipment and piping shall be removed by the Contractor at his own expense.

16.3.2 Temporary Electricity

The Contractor, at his own expense shall provide temporary electricity connection at three (3) points and at locations within the site areas from the PESCO and shall make all the necessary arrangements for temporary electricity services, pay all expense in connection with the installation, operation and removal thereof and pay the costs of electricity consumed by all trades at commercial rates of PESCO.

Notwithstanding to above, to ensure uninterrupted work at site against any unforeseen reasons he shall arrange and furnish an Electric Power Generating set at site and maintain the generating set in perfect working condition through-out the duration of Contract. The generating power of the set shall be sufficient to operate all plant and equipment as well as the camps and offices of the Contractor and the offices of the Engineer/Employer, during

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construction at site. Should the set fail to meet the required demand at site or fail to function or operate, the Contractor shall immediately replace the same with other generating set/sets to the satisfaction of the Employer as well as the Engineer.

Temporary lighting system shall be furnished, installed and maintained by the Contractor as required to satisfy the minimum requirements for safety and security and to the satisfaction of the Engineer.

At completion of construction work, temporary electricity services shall be removed by the Contractor at his own expense.

The Employer upon the recommendations of the Engineer may provide elect supply connection to the Contractor if he so required and requests to the Engineer (a lump sum amount of Rs. 5000/- per each connection point shall be paid on monthly basis) as per available wapda services whatever may be the status of load shading of Wapda.

The generator connection if required to the Contractor from the Employer he shall process the request separately and the Employer may provide the same if agreed.

16.3.3 Waste Disposal

The Contractor shall make such temporary provisions as may be required in order to dispose of any chemicals, fuels, oils, grease, bituminous materials, waste and soil waste and the like without causing pollution to either the site or the environment. Disposal of any materials, wastes, effluent, garbage, oil, grease, chemicals and the like shall be in areas specified by the concerned local authority proposed by the Contractor and subject to the approval of the Engineer. If any waste material is dumped in unauthorized areas the Contractor shall remove the material and restore the area to the condition of the adjacent undisturbed area. If necessary, contaminated ground shall be excavated, disposed off as directed by the Engineer and replaced with suitable fill material compacted and finished with topsoil all at the expense of the Contractor.

16.3.4 Fire Protection

The Contractor shall provide and maintain adequate fire protection in the form of barrels of water with buckets, fire bucket tanks, fire extinguisher, or other effective means ready for instant use, distributed around the project and in and about temporary inflammable structures during construction of the works.

Gasoline and other flammable liquids shall be stored in and dispensed from safety containers approved by the Engineer and storage shall not be within building.

Torch-cutting and welding operations performed by the Contractor shall have the approval of the Engineer before such work is started and a chemical extinguisher is to be available at the location where such work is in progress.

The Contractor shall follow the instructions and specifications of the Civil Defense Department or any other local department concerned with such activities.

16.3.5 Telephone

The Contractor shall provide and maintain adequate one land line telephone (PTCL) on site. The contractor shall be responsible for installation and connection charges as well as monthly charges. The telephone shall be made available to the Engineer for due performance of their duties at all time and free charge during construction and defect liability period.

16.4 Sign Board

The Contractor shall erect and maintain at the Site in a location to be approved by the Engineer two (2) Sign Boards of minimum 6'x4' dimensions approved by the Engineer. The Sign Boards shall be made of metal, MS Sheet. It shall be mounted on steel posts securely

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anchored and braced. The Contractor shall paint on the Sign Boards, the name of the Works, and the names of the Employer, Engineer, the Consultant and the Contractor both in English and Urdu Language.

16.5 Site Offices and other Facilities for the Engineer / Engineer Representative

The Contractor shall, within fourteen (14) days of the commencement of any work at the Site provide for the exclusive use of the Engineer or thereto Resident Engineer Office accommodation at site comprising covered area of not less than Four Hundred (400 Sft) along with washroom facility, of approved design and specification by the Engineer, along with suitable approaches (Framed Structure, Raft foundation, BB Work, CSM, RCC Roof, PC Plaster, PCC floor etc. as directed by the Engineer). The site office shall be connected to the electrical, portable water supply and sewage disposal systems.

No payment shall be made for the works involved within the scope of this section of specifications, the cost thereof shall be deemed to have been included in the Premium/ discount and total price quoted by the Contractor. Upon completion of Project the Site Office shall become property of the Employer.

If the Contractor fails to provide above facilities, the Engineer shall submit the case to the Employer for execution of the same at the Risk and Cost of the Contractor and shall be charged to the Contractor's bills/IPC's/FPC.

16.5.1 Transportation for the Employer and Engineer

The Contractor shall provide transportation facility for sampling, testing and visit to laboratories as required by the Engineer

16.6 Site Facilities to be provided by the Contractor

16.6.1 General

Without prejudice to the generality of the various clauses of the Contract, particular attention is drawn to the obligation of the Contractor to make his own arrangement at his own expense for the following.

16.6.2 Labour Camps and Staff Residences

The Contractor shall provide, operate and maintain labour camps and staff residences and are required for the proper and efficient progress of the work to house his own employees. For the purposes of operation and maintenance of the Camps and Residences, the Contractor shall comply with the rules of Pakistan Labour Camp Rules 1960 and all other applicable provisions of the Pakistan Labour Laws.

16.6.3 Administrative and Field Office

The Contractor shall provide, operate and maintain administrative and field offices required for his staff and would be responsible for Operation and Maintenance, furniture, equipment, appliances, janitor services and security of the same.

16.6.4 Work yards and Storage Areas

The Contractor shall provide, operate and maintain all sheds, fencing, foundations and all above ground structures required to store material or equipment brought on to the site by him. The Contractor shall be responsible for the security of his entire camps, residence, site and field offices work yard and storage area.

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16.6.5 Water Supply, Sewerage System and Electricity

The Contractor shall make his own arrangement, at his own expense for provision, operation and maintenance of electric supply, reasonable supplies of raw and potable water and sewerage system at the site of works and his labour camps, staff residences and offices. The Contractor shall pay all fees, and charges (including bills) of whatsoever nature to the concerned departments (if any) in order to procure connections of the above facilities and thereafter using these facilities.

16.6.6 Medical Care

The Contractor shall be responsible for the medical care of the Project staff and labour and shall provide and maintain at his own expense suitable first aid center at site and camps for use by the Project staff and labor.

16.6.7 Other Facilities

The Contractor shall also be responsible for providing at his own cost other facilities for the Project staff and labor such as educational, recreational, transport, telephone and catering if required.

17. CONSTRUCTION PROCEDURES

The Contractor shall advise the Engineer of proposed construction procedures in accordance with the General Conditions of Contract.

If the Engineer shall see that the work progress is slow in such a way that the work will not be completed in the time specified, then he shall order the Contractor to work overtime or in more shifts and the Contractor shall obey these orders without any additional payments and without any objections or request for compensation. In that case overtime payment of Consultant supervising team shall be charged to the Contractor & deducted from Bills & paid to the Consultant by the Employer.

18. NOTIFICATION TO ENGINEER FOR INSPECTIONS

The Engineer shall be notified daily in writing of the nature and location of the Works the Contractor intends to perform the next day so as to enable necessary inspection and measurement to be carried out. The Engineer may, if necessary, direct that longer notice be given of certain operations.

19. EXISTING SERVICES

The Contractor shall search for, find, locate and protect any wiring, cable, duct, pipework, etc. within or immediately adjoining the site area. The Contractor shall be responsible for safety of existing services lines, utilities and utility structures uncovered or encountered during excavation and construction operations.

The Contractor shall be responsible for damaging any such service lines, utility, utility structure and any cost and/or expense that arise or issues from any such damage shall be borne directly by him. Should any damage to any such service occur the contractor shall forthwith take remedial action, initiate safety precautions, install temporary services and carryout repair all at his own cost and expense and inform the Engineer with a copy to the Employer.

Existing utilities which are to remain in service for or after the works are to be determined by the Contractor. If any existing service lines, utilities and utility structures which are to remain in service are uncovered or encountered during these operations, they shall be safeguarded, protected from damage, and supported.

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20. NIGHT WORK

No Work shall be allowed at night unless specifically allowed by the Engineer/Resident Engineer under special circumstances. When work is done at night, the Contractor shall maintain from sunset to sunrise such lights on or about his work and plant as the Engineer may deem necessary for the proper observations of the work and the efficient execution thereof. The contractor shall be responsible to pay for the overtime payment and other expenses to the Resident Engineer and its staff.

21. WEATHER

No work is to be undertaken when, in the opinion of the Engineer, the weather is not suitable that proper protection of the work cannot be ensured.

22. CO-ORDINATION WITH OTHER CONTRACTORS

It shall be the responsibility of the Contractor to co-ordinate and keep-up good relations with other Contractors employed on site by the Employer.

23. ACCIDENT PREVENTION, PROTECTIVE EQUIPMENT

The Contractor shall comply and enforce compliance by all his sub-contractors with the highest standards of safety and accident prevention in accordance with international standards and in compliance with all applicable laws, ordinances and statutory provisions.

All requisite barriers, fences, warning signs, lights and other safety precautions as required for the protection of persons and property on or adjacent to the site shall be provided at the Contractor's cost.

All false work, scaffolding and handrails shall be well constructed and secured at all times. Where overhead work is being carried out, warning signs shall be installed at ground level clearly warning of the overhead work.

All warning signs shall be in two languages, English and Urdu, and shall at all times be maintained in a clean and legible condition, to the satisfaction of the Engineer.

Trash shall be removed at frequent intervals to the satisfaction of the Engineer.

24. SETTING OUT OF WORK & SOIL INVESTIGATION SURVEY

24.1 Topographic Survey Reference Points, Lines & Re-confirmatory Soil Investigation

The Contractor shall carry out detailed topographic survey of the project site showing all its existing features, services, levels, contours, plants etc. & establish benchmarks and/ or reference line at the Site in accordance with the instructions of the Engineer/Resident Engineer. The Contractor shall set out the work from these benchmarks and lines and submit the soft & hard copies of the survey plan to the Engineer/Resident Engineer. The Contractor shall also carry out re-confirmatory geo-tech investigation of the project site as determined by the Engineer/Resident Engineer with complete programme to be supplied by the Engineer's representative to check bearing capacity of the project sites, if so required and ordered by the Engineer subject to the approval of the Employer.

24.2 Verification

The Engineer may make checks as the work progress to verify lines and grades established by the Contractor and to determine the conformance of the work as it progresses with the requirements of the Drawings and Specifications. Such checking by the Engineer shall not relieve the Contractor of his responsibility to perform all work in accordance with the Drawings and Specifications and the lines and grades given therein.

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24.3 Survey Instruments

The Contractor shall maintain at the Site the requisite surveying instruments in perfect working conditions to enable the Engineer's Representative to check levels and lines of the work at all times.

25. MONTHLY JOINT PROGRESS MEETING

A monthly Joint Progress Meeting (JPM) between the Engineer/ Engineer's representative and Contractor shall be held on site to review, evaluate and discuss the progress of the Project.

Any instructions issued to the Contractor through the minutes of the meeting shall have the same effect as instructions issued by the Engineer under General Conditions of Contract.

The Contractor shall make all necessary arrangements for such meetings, including the preparation and presentation with respect to the Project directed by the Engineer.

26. PRECAUTION FOR POLLUTION

Precautionary measures and facilities shall be provided by the Contractor at his own cost in carrying out the Works including dumping and disposal of spoils, in the manner approved by the Engineer to prevent environmental pollution.

27. COORDINATION OF WORKS AT SITE

The Contractor shall take cognizance that during the execution of the project, other Contractor will be working concurrently on this site.

All works of his responsibility shall be coordinated by the Contractor so as to give the necessary facilities to other Contractors or their workmen or any other employee, who execute or supervise any work on the Site.

The Contractor shall ensure that the necessary safety precautions will be observed and interferences shall be avoided especially for the works executed side-by-side by different Contractor.

Due consideration must be given to permit access to sections of the work as required by other contractors for the extension of their works. With a view to coordinate the works, the Engineer may from time to time direct the order of the works to be carried out.

28. SHIFTING / RE-ROUTING OF SERVICES

The contractor shall be responsible for shifting /re-routing/diversion of services if any in the site area and shall coordinate with the concerned agencies/department and facilitate the client for the purpose without any claim/cost.

29. PREVENTIVE / PRECAUTIONARY AND SECURITY MEASURES

Project site being located in the high security zone, the contractor shall make security clearance of his staff/labor and vehicles deployed at the project. Preventive / precautionary and security measures shall be adopted. Security passes shall be made by the contractor for his staff for identification purpose at their own cost and responsibility.

30. DISMANTLING OF EXISTING STRUCTURE

The contractor is required to undertake dismantling of existing structure, if any, falling in the project area for construction of the project work and visit the site to ascertain the quantum of work. The cost of dismantling work is deemed to have been covered under the quoted rate/bid.

Seal and Signature of Bidder M/S_____

31. CONSTRUCTION & CHECKING AT SITE

- 31.1 The contractor shall submit to the engineer in due time for approval and discussion, his proposal and plan as to the method and procedure to be adopted for the temporary and permanent works involved.
- 31.2 The submitting to these suggestions and arrangement, and the approval thereof by the engineer shall not relieve the contractor of his responsibilities and duties under the contract.
- 31.3 The carrying out of all work included in the contract is to be supervised by a sufficient number of qualified representatives of the contractor and full facilities and assistance are to be afforded by the contractor to manage, check & examine the execution of the works in accordance to the contract.
- 31.4 No physical work shall be carried out without prior approval of the Engineer's representative and in absence of Engineer's representative, further to ensure quality work it is mandatory to submit to the Engineer on daily basis the inspection program for the next day and a check request book shall be maintained which shall be submitted for each activity along with supporting documents such as level sheet, bar bending schedule etc. This check request after approval by the Engineer shall be attached with monthly statement/IPA/IPC for verification of work done on site to the Engineer and to the Employer if asked.
- 31.5 The measurement sheets for each item of work carried out and claimed/submitted for payment shall be provided with a column showing number of approved check request confirming the physical execution of work in presence of the Engineer's Representative.
- 31.6 All the bills i-e running or final (IPA/IPC/FPC) etc. shall be prepared by the contractor computerized as per approved pattern of the Employer having title page, classification sheet, IPC, summary of costs, abstract of costs and prices, measurements sheet/record entry and other documents. The bill shall be submitted to the Engineer for verification at site, which shall be amended by the contractor if any change is done/ proposed by the Engineer/Employer. Upon payment six copies shall be arranged by the contractor for his own record and other relevant offices.
- 31.7 The Contractor shall engage supervisory staff for execution of works as mentioned in the Appendix to Bid. In case of failure (of Contractor to hire the minimum staff), the Employer upon recommendation of the Engineer shall hire the same from open market in a suitable rate/salary, which shall be charged to the bills of the Contractor.

32. PAYMENT OF WORK

No payment shall be made for the works involved within the scope of this section of specifications unless otherwise specifically stated in the Bills of Quantities or herein above.

The cost thereof shall be deemed to have been included in the Premium/ discount/%age rates and total price quoted by the Contractor.

Seal and Signature of Bidder M/S_____

Check List

For Preparation and Submission of Bidding Documents

Single Stage Two Envelop Bidding

Ser	Description	Remarks
1.	Have you carefully studied and signed each page of the bidding document?	Yes / No
2.	Do you certify that Bid Documents have been downloaded from website by yourself, you did not contact any University's/work's person/staff other than for site visit before submission of bid?	Yes / No
3.	Are you eligible to participate in bidding as per NIT/ and ITB-3, PEC Registration No. _____ Category C- _____ Valid upto _____.	Yes / No
4.	Have you visited the site, got requisite information in respect of bid, and submitted the bid for complete scope of work?	Yes / No
5.	Have you submitted Qualification Documents and Technical Proposal in separate envelop as per ITB.	Yes / No
6.	Have you submitted Financial Bid in separate envelop as per ITB.	Yes / No
7.	Have you put the both envelops (i-e Technical and Financial) in one envelop, sealed, stamped signed the top as per PPRA Rules, Bid Documents?	Yes / No
8.	Have you attached Bid Security (Original) to Financial Bid and attached certificate of availability in Technical Bid as ITB?	Yes / No
9.	Do you know that your bid shall be valid for 120 days?	Yes / No
10.	Have you properly filled Rates/percentage in specified space in summary of Bill of Quantities, keeping in view Detailed BoQ, BoQ/CSR/MRS Rates, Preamble of BoQ, Conditions of the Contract, Drawings, and Specifications?	Yes / No
11.	Do you know that items, quantities of BoQ can be increased, decrease and even deleted during execution and performance of the Contract?	Yes / No
12.	Do you know that Tax @ 7% is included by Govt. in MRS/CSR rates and are shall not payable to the firms pertaining to tax exempted area, as not going to be paid by firms to Govt.?	Yes / No
13.	Shall you provide Performance Bond if Contract is awarded to your firm?	Yes / No
14.	Do you know that time for completion of entire works under this bid is only twelve months?	Yes / No
15.	Do you certify that you shall complete the entire works, remedy therein defects in accordance to the BoQ, Specifications, drawings, appendices and Conditions of the Contract?	Yes / No
16.	Have you revisited University's website on the second last day of submission of bid for updating yourself in respect of bidding?	Yes / No

Seal and Signature of Bidder M/S _____

**SHAHEED BENAZIR BHUTTO UNIVERSITY
SHERINGAL DIR UPPER KHYBER PAKHTUNKHWA
PAKISTAN.**

- **BUILDING ITEM:** **CONSTRUCTION OF MULTIPURPOSE HALL**
- **PROJECT NAME:** **“DEVELOPMENT OF UNIVERSITY OF DIR, SHERINGAL”.**
- **SPONSORING AGENCY:** **HIGHER EDUCATION COMMISSION ISLAMABAD.**
- **FUNDING AGENCY:** **PLANNING COMMISSION, GOP.**

**Tender/ Contract Documents/
Specifications Technical Provisions**

Volume-II

November, 2018



**ASSOCIATED CONSULTING ENGINEERS
– ACE (PVT) LTD**

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ISO 9001 Certified



**Project Director/ Director of Works/
Directorate of Planning &
Development, Shaheed Benazir Bhutto
University Sheringal Dir Upper**

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Contactor M/S _____
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Note:

Apart from these specifications, the Composite Schedule of Rates (CSR/ MRS) Technical Specifications, latest edition issued by Govt. of KPK shall be adhered for this Contract, unless otherwise specified for entire MRS items referred in the Contract / BOQ.

Signature_____

Contactor M/S_____

Seal_____

CIVIL WORKS

Signature_____

Contactor M/S_____

Seal_____

1.0 General

Unless otherwise specified herein all materials to be used shall strictly comply with the specifications included in these documents.

1.1 BURNT BRICKS

They shall be well burnt without being vitrified. They shall be of uniform colour regular in shape and parallel faces. They must be homogeneous in texture and emit clear ringing sound when struck. They shall be free from flaws and cracks. They shall not absorb more than $1/5^{\text{th}}$ of their weight of water being soaked for one hour and shall show no signs of efflorescence on drying.

1.1.1 Size and Strength

The nominal size of the bricks shall be $9" \times 4\frac{3}{8}" \times 2\frac{11}{6}"$ (228x111x68mm) and the minimum size shall not be less than $8\frac{5}{8}" \times 4\frac{1}{8}" \times 2\frac{5}{8}"$ (219x105x67mm). the compressive strength shall not be less than 2000 lbs/sq. inch.

1.2 FINE AGGREGATE**1.2.1 Source**

Fine Aggregate shall be obtained from approved sources.

1.2.2 Grading

Fine Aggregate shall consist of well graded sand stone screening other inert material of similar characteristics or a combination of these.

Fine Aggregate shall conform to the requirements of B.S. 882 and/or PS 243 Only. Fine Aggregate of grading zones 1 to 3 (B.S. 882) shall be used. Aggregate of zone A may be used for special mixes only after written approval.

1.2.3 Cleanliness

Fine Aggregate shall be clean and free from clay lumps soft and flaky particles, shale, alkali organic matter loam mica and injurious amounts of deleterious substances shall not exceed 5 percent by weight.

1.2.4 Quality Fine Aggregate shall be sharp cubical hard dense and durable.**1.2.5 Storage and Protection**

Fine Aggregate shall be stacked on a brick, wooden or other suitable platform so as to adequately protect it from dust and other admixtures. These may be washed if required.

1.3 COURSE AGGREGATES**1.3.1 Source**

Course aggregates shall be obtained from an approved source. Coarse aggregate should conform to the requirements of B.S. 882 and/or P.S. 243.

Signature _____

Contactor M/S _____

Seal _____

The gradation limits shall conform to the requirements of the B.S. 882 Part-1, 1905 or any latest amendments. It shall consist of quarried crushed stone or other inert material and combination of these as specified or as approved.

Wherever feasible the normal maximum size of aggregate for cast-in-place reinforced concrete slabs and other thin members shall be $\frac{3}{4}$ ". If there are difficulties in placing such a concrete the maximum size may be restricted to $\frac{1}{2}$ " provided the requirements for strength are satisfied.

1.3.2 Cleanliness

Coarse aggregate shall be clean and free from soft friable thin or elongated pieces alkaline organic matter or injurious amounts of deleterious substances.

The sum of the percentage of all deleterious substances in any size shall not exceed 3 percent by weight. Cleanliness of the aggregate should conform to the requirements of ASTM C-117, C-142, C-123 and C-140.

1.3.3 Quality

Coarse Aggregate shall consist of well shaped hard dense durable uncoated rock fragments as approved.

1.3.4 Storage and Protection

Coarse aggregate shall be stacked on a brick wooden or other suitable platform so as to adequately protect it from dust and other admixtures. Each type and size of aggregate shall be stacked separately. These may be washed if required and Contractor will do this without any extra charges.

1.4 BITUMINOUS MATERIAL

1.4.1 General

The bituminous material shall be straight grade asphalt of 10/20 penetration for use in damp proofing work in DPC and filling in Expansion joints etc.

The material shall be of best quality manufactured in Pakistan and shall conform to the following specifications:-

a]	Specific Gravity at 77 °F	1.02/1.04
b]	Softening Point (R & B)	170/200 °F
c]	Penetration at 70 °F, 100gm.	10/20
d]	Ductility at 77 °F (cms)	4/7
e]	Solubility in Cc 14 (Min.)	99.5%
f]	Working Temperature	300/35 °F

Signature_____

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1.4.2 Protection/Test

The approved quality of materials shall be brought in sealed containers or with a certificate of manufacture regarding the quality standard of the material. The storage and application of the material shall strictly follow the manufacturer's instructions.

1.4.3 Bituminous Material for Roof

Special bitumen shall be used as sealing material for the roof, it shall be a mineral filled thixotropic special bitumen emulsion which meets A.I.B. standard No. 4683.03 and shall have the following properties:

a]	Base Material	Bitumen/latex/coatchou emulsion.
b]	Solvents	Free from Solvents.
c]	Consistency	Soft Paste.
d]	Density	1.1 gm/cm ³
e]	Dry Residue	05 %
f]	Flash Point	Non Flammable
g]	Heat	Resistance Upto 150 °C (Dry Heat)

1.4.4 Mastic Asphalt

Mastic asphalt shall be used as sealing material for the foundation raft, it shall conform to B.S. Specifications 1097-Oct. 1973 for (Mastic Asphalt for tanking and damp proof course).

1.4.5 Special Imported Water Proofing Material (VANDEX), Sika, Fosrock.

Special Imported Water Proofing material shall be used to completely water proof basement roof and joints. It shall be applied in accordance with the manufacturer's recommendations and the applicable drawings.

1.5 BITUMENIZED PAPER/POLYTHENE**1.5.1 General**

Unless otherwise specified the building paper shall conform to B.S. 4016. It shall be smooth stout and possess through water proofing qualities. Building Paper/Polythene sheet shall be used where specified in the Drawings. Double layer shall always be used with 2" (50 mm) side laps and 6" (150 mm) end laps wherever specified.

1.5.2 Test Sample

The building paper if used shall weigh 40 to 50 Kg./100 meter square (8 to 10 lbs./100 Sft.). In case of polythene sheet the thickness shall not be less than 0.2mm (.008") per layer.

Signature_____

Contactor M/S_____

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The samples shall be approved before incorporation in the work. The Contractor shall submit the samples which shall be retained till the completion of the work. The cost of such samples shall be deemed to be included in unit rate of the relevant items entered in the Bill of Quantities.

1.6 CLAY / EARTH

1.6.1 General

Clay shall be plastic and obtained from approved sources and shall have fine sand in the range of 20 to 30 %. It shall not contain more than 0.5% soluble salts; more than 0.2% sulphate more than 4% organic contents. It shall not contain any gravel, coarse sand, kanker, roots of grass and plant and other injurious matters.

1.6.2 Preparation

Clay before use shall be dug up and left to weather for a week. It shall be thoroughly watered repeatedly turned over and tempered for at least 48 hours before use until it is homogeneous and stiff.

1.7 WIRE GAUZE

1.7.1 General

Unless otherwise specified the wire gauze shall be of best quality approved uniformly, woven wire webbing of 12 x12 meshes to 645 mm square (one Sq. Inch) made from 22 gauge galvanized iron wire. All panels shall be in one piece and no joints shall be allowed.

1.7.2 Fixing

Wire gauze shall be fixed as shown on the drawings or as directed. The gauze shall remain tight to the full width without any sag.

1.8 GLASS

1.8.1 General

Clear Glass shall be of best quality manufactured in Pakistan except as may be otherwise called for on the drawings.

Quality

The quality and specifications of glass used shall be as follows:-

All glass shall be of approved manufacture and quality.

Each kind of glass described below shall be labeled by its manufacturer and the labels left on until their removal is authorized:

- a) Sheet glass unless specified otherwise shall be flat drawn weighing not less than 6.87 gms/sq.c. (22-1/2 ounces per square foot) and shall be the type as

Signature _____

Contractor M/S _____

Seal _____

defined in the British Standard Specification 952 or equivalent ASTM Standard.

- b] Plate glass unless specified shall be best quality bajri glass manufactured in Pakistan. It shall not be less than 5mm thick and at least as obscure as syenite glass.
- c] Plate glass unless specified otherwise shall be of the quality as defined in British standard 952 and shall be 5mm thick. Glazing compound for use in wooden frames for interior and exterior glazing shall conform to the requirements of B.S. 544. Compound for metal frames shall be as recommended by the manufacturer for the particular application.

1.8.2 Samples

Samples of all kind of materials to be used in the job shall be submitted for approval to before incorporation in the work.

1.9 LIME

1.9.1 Definition

Unless otherwise specified "LIME" shall mean stone lime or Kanker Lime.

1.9.2 Source of Stone Lime

Stone fat or white lime shall be manufactured from lime stone containing at least 90% pure carbonate of lime.

1.9.3 Source of Stone Lime

Kanker lime shall be burnt from good quality kanker boulders having a blue grey fracture, free from sand grains. The kanker shall be quarried from an approved source.

1.9.4 Storage

Lime shall be stored in dry and weather proof sheds on a compact heap so as to expose as small an area as possible to air to prevent air slaking. Lime shall not be stored for a long period after burning but used as fresh as possible.

1.9.5 General

- Wherever lime appears in specifications or Bill of Quantities it will be taken to mean "Lime Putty".

1.10 PAINTER AND DECORATOR

1.10.1 Conformity to Standards

Except as otherwise specified, all painting work shall be carried out in conformity with British Standard Code of Practice CP-231 "Painting" as applicable to the work.

Signature _____

Contactor M/S _____

Seal _____

1.10.2 Materials

All materials used shall conform to the applicable British Standard Specifications and shall be used as per manufacturer's printed directions.

Paints shall be high grade enameled products of known manufacturer and, when approved, shall be delivered on the work in original unbroken packages bearing the manufacturer's brand and name.

Colour Pigments shall be pure, non-fading and finely grounded and at least 99% passing through a 325 mesh sieve.

Distemper shall be obtained from an approved quality and make. It shall be delivered at site in original unbroken packages bearing the maker's name and brands. Any pigment content shall be lime proof.

Snowcem shall be delivered at site in original and sealed packages, bearing the manufacturer's brand and name.

Brushes All brushes used for Painting work shall conform to the requirements of B.S 2096.

Lime shall conform to B.S 890 "Building Lime".

Wax Polish shall be of best quality available in Pakistan and as approved.

Spirit Polish shall have shellac of approved quality.

1.10.3 Colour Schedule

The colour, shade and surface finish required for various materials shall be as approved.

1.10.4 Samples and Application Specifications

Samples of the paints used for the work shall be approved as and same type of paint shall be used throughout.

Certified data, test samples and detailed application specifications shall be submitted for approval. If the material is to be tested, this will be got done by the Contractor at his own cost from an approved laboratory.

1.11 VARNISH**1.11.1 Source**

Varnish shall be procured from an approved source or manufacture.

1.11.2 Quality

Varnish shall be clear, transparent and suitable for use on exterior or interior work, as specified and shall give a uniform and glossy coating, free from runs and specks.

Signature _____

Contactor M/S _____

Seal _____

1.13.3 Sap Wood

Sap wood shall not be permissible in any work i.e. in carpentry, joinery and structural works.

1.13.4 Knots

Timber shall be free from knots, other than sound knots appearing on surface only and not exceeding $\frac{1}{2}$ " (15mm) diameter. Such loose or decayed dead knots shall not be permissible in any joinery and shall be cut out and plugged properly.

1.13.5 Shakes

Straight splits or shakes shall be permissible in the ends up to a total for both ends of 2" (50mm) per meter of length at the time of passing.

Timber shall not be spongy or in brittle condition.

1.13.6 Size

The round logs of timber shall not be less than 10' (3meters) and more than 40' (12meter) in length and 7' 2.1 meter) in girth. Tapered logs shall not be less than 4' (1.2 meter) in girth at the small end.

Squares shall be of the size not less than 10' (3 meter) in length and 16"x16" (400mm x 400mm) in cross section.

Sleepers shall be obtained from logs cut from sound and mature trees.

1.13.7 Storage

Timber shall be stacked on a raised wooden or paved platform to eliminate chances of white ant attack.

It shall be stacked under a proper shelter, where maximum aeration is possible without subjecting it to the direct sun, rain or other weathering agents.

1.13.8 Miscellaneous

In all other respects, timber should conform to the applicable requirements of B.S. 1186.

1.14 WATER**1.14.1 Source**

Water for construction shall be obtained from an approved source.

1.14.2 Quality

Water shall be free from clay, vegetable, organic impurities and any other substance likely to cause efflorescence or interfere with setting of mortars or otherwise be harmful

Signature _____

Contactor M/S _____

Seal _____

to the work. Broadly speaking any water which does not show an intensive odor or brackish test shall be considered suitable for building works, whereas water fit for drinking, shall be accepted as suitable for all engineering works. P.H. value of water shall range between 6 and 8. Where doubts exist as to the suitability of water it shall be tested in accordance with B.S. 3148.

1.14.3 Storage

Water shall be stored in water tight tanks or containers adequately protected from the admixture of dust and other foreign matter.

1.15 PORTLAND CEMENT

These specifications cover five types of port-land cement, as follows:-

Type-I For use in general concrete construction when the special properties specified for type-II, III IV and V are not required.

Type-II For use in general concrete construction exposed to moderate sulphate action, or when moderate heat of hydration is required.

Type-III For use when high early strength is required.

Type-IV For use when low heat of hydration is required.

Type-V For use when high sulphate resistance is required.

1.15.1 Definition

Portland cement is the product obtained by pulverizing clinker consisting essentially of hydraulic calcium silicates to which on additions have been made subsequent to calcinations, other than water and/or untreated calcium sulphate, except that addition of other non-deleterious materials may be added at the option of the manufacturer in an amount not to exceed 0.1%.

1.15.2 Physical Requirements

Portland cement of each of the five types shown above shall conform to the requirements of ASTM Designation C-150 or B.S. Specifications No. 12.

1.15.3 Packing and Marking

When the cement is delivered in packages, the name and brand of the manufacturer and the type, shall be plainly identified thereon. When the cement is delivered in bulk this information shall be contained in the shipping invoice accompanying the shipment-A bag shall contain 50 kg. All cement shall be fresh and of approved origin and manufacture.

Signature_____

Contact M/S_____

Seal_____

1.15.4 Inspection

Every facility shall be provided for careful sampling and inspection either at the mill or at the site of work. The following periods from time of sampling shall be allowed for completion of testing.

1-day test	6 days
3-day test	8 days
7-day test	2 days
28-day test	33 days

1.15.5 Rejection

The cement may be rejected if it fails to meet any of the requirements of these specifications.

Cement remaining in bulk storage at the mill, prior to shipment for a period greater than six months after completion of the tests, may be tested and may be rejected if it fails to conform to any of the requirements of these specifications.

If the variation in weight of any shipment is 3% in the lower side than the entire shipment may be rejected.

Cement failing to meet the test for soundness in the autoclave may be accepted if it passes a retest, using a new sample, at any time within 28 days thereafter. The provisional acceptance of cement at the mill shall not override the right to reject on a retest of soundness at the time of delivery of the cement.

The Contractor shall supply, if required, at fortnightly intervals, test Certificates with the dates of such test, showing that the cement complies with the appropriate standard. These tests shall be carried out in a approved laboratory. Only one brand of each type of cement shall be used for concrete in any individual member of the structure. Cement shall be used in the sequence of receipt of shipment, unless otherwise directed.

There shall be sufficient cement on site to ensure that each section of work is completed without interruption.

Cement reclaimed from cleaning of bags or from leaky containers shall not be used.

The mixing together of different types of cement will not be permitted.

1.15.6 Method of Sampling and Testing

The sampling and testing of port-land cement shall be in accordance with relevant B.S. or A.S.T.M. (C-150-74) standard specifications.

Signature _____

Contactor M/S _____

Seal _____

Contractor shall carry out tests on Ordinary Portland Cement, Sulphate Resistant Cement and White Cement at his own cost, if and when required.

The sampling and testing of Portland Cement shall be in accordance with the relevant B.S. or A.S.T.M.(C-150-74) standard specifications.

- i] The sacks should be stacked closely on a damp proof floor or on timber planks raised 12" (300mm) or so from the ground with air space below. There should be similar air space between the stacks and walls and roof of the building, which should have sound weather proof walls and roof.
- ii] To avoid bursting of bags and setting under pressure the height of the stacks shall be limited to 8 bags.

1.15.7 Limitation of Use

No cement stored through a monsoon or for more than six months should be used, unless tests have been applied and cement meets the requisite standard.

1.15.8 Sulphate Resisting Cement

The sulphate resisting cement is to conform to the B.S. Specification Nos:-4027, 1966 which stipulate as below:

- i] Chemical Analysis:

Magnesium Oxide	4.0% (Max)
Loss of Ignition	4.0% (Max)
Insoluble Residue	1.5% (Max)
Tri-Calcium Aluminates	3.5% (Max)
lime Saturation Factor	.66-1.02% (Max)
- ii] Physical Tests:

Fineness Specific Surface	
Sq. Cm. per Gm.	2500 (Max)
Soundness, Le-Chatelier	
Test	10mm (Max)
Setting Time	
a] Vicat Test, initial Set in	

Signature _____
Contactor M/S _____
Seal _____

		SECTION - 1:	MATERIAL
	Minutes	45	{Max}
b]	Final Set in Hours	10 Hrs	{Max}
iii]	<u>Compressive Strength</u>		
	3 Days - Lbs. Per Square Inch		2200
	7 Days - Lbs. Per Square Inch		3400

The Sulphate Resisting Cement where specified shall conform to P.S. 612 or B.S. 4027 with appropriate content of Tricalcium aluminates. A requirement of ASTM C-150 for Type (V) is that the contents of C-4 AF plus twice the amount of C3A shall not exceed 20percent.

1.15.9 Guidelines for the Use of Sulphate Resisting Cement

To save the structures from sulphate attack and to obtain lasting immunity, the following precautions should be taken when using sulphate resisting cement.

- i] Water curing of the structures should be done for a longer period before exposure to the sulphate water. An intermediate period of drying in air also increases the resistance owing to the formation of an impermeable calcium carbonate skin.
- ii] A rich mix should be used with a low water cement ratio.
- iii] A dense concrete should be used to give it a greater tightness against penetration by the sulphate solutions.
- iv] Steam curing at a temperature of 100 degree Centigrade and above greatly increases the resistance to sulphate attack, sometimes to the point of immunity.

Curing below 100 degrees Centigrade does not increase the resistance and sometimes decreases it.

1.16 WHITE CEMENT

1.16.1 White Cement

White Cement shall be non-staining, water repellent Portland Cement conforming to relevant B.S. or ASTM standard which shall be tested in accordance with the relevant stipulations of Clause 1.15.6 for Ordinary Portland Cement.

White Cement used where specified shall conform to the Specifications of iron oxide contents below 1 percent. The strength characteristics shall be the same as ordinary Portland Cement but produced in an oil fired cement kiln at 3100 °F to 15 percent.

Signature _____

Contact M/S _____

Seal _____

1.16.2 Characteristics / Properties

White Portland Cement is a chemical product of several compounds which are in a state of fine division chemically active and highly sensitive to moisture. Its essential qualities are hydraulic in nature i.e. it sets and hardens when worked with water. A good white cement which combines the properties of its numerous compounds, will set when water is added to it in a regulated time; it will harden and gain strength progressively, its strength will not show retrogression in strength at a later period and will have constancy of volume. Above all, the basic requirement it has to fulfill concerns its appearance which must be white, without any contamination of iron or anything else. To maintain this primary property viz. whiteness, great care has to be taken at every stage of its production. The characteristic and properties of white cement are fineness, setting time and soundness. It has to conform to the most rigorous specification in respect of soundness. This is most important, for any lack of proportion in the elements that produce it or any negligence in the production processes would spoil the product. In other words even the slightest defect in the manufacture would make the things made from it such as hydraulic tiles or other molded articles unsatisfactory.

1.17 COLOURED CEMENT**1.17.1 Coloured Cement**

Colours are imparted to ordinary cement by mixing colouring matter to it in the form of mineral pigments. Usually 5 to 10 percent of the colouring matter is added to obtain the required shade. The mineral oxide used as pigments are rather costly.

Iron oxide gives red, yellow or brown; Chromium oxide gives green colour; Cobalt gives blue colour. For black or brown colour manganese dioxide is used. White cement is prepared with raw materials almost free from iron; it has the normal setting of ordinary cement, except for the absence of any colour but white.

1.18 MILD STEEL REINFORCEMENT GRADE 40 & 60**1.18.1 Material and Manufacture**

The bars shall be rolled from billets of Karachi Steel Mill properly identified heats of mold cast or strand cast steel using the open hearth, basic Oxygen, or electric-furnace process. The reinforcement steel shall be obtained only from the approved manufacturers.

1.18.2 Chemical Requirements

Manufacturers shall perform analysis of test samples and determine the percentages of carbon, manganese phosphorus and sulphur. The phosphorus content shall not exceed 0.05%. It will be obligatory for the Contractor to furnish manufacturers certificate stating chemical composition of the Steel Reinforcement.

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1.18.3 Requirements for Deformations

Deformation shall be spaced along the bar at substantially uniform distance. The deformations on opposite sides of the bar shall be similar in size and shape. The spacing height and gap of deformations shall conform to the requirements prescribed in Table-1.

TABLE-1 DEFORMED BAR DESIGNATION NUMBER, NORMAL WEIGHTS, NOMINAL DIMENSIONS AND DEFORMATION REQUIREMENTS.

NOMINAL DIMENSIONS In Inches					*DEFORMATION *REQUIREMENTS *In Inches		
BAR NO.	WT. LB/FT	DIA IN.	X-SEC AREA IN 2	PERI-METER IN	MAX. AVERAGE SPACING	MIN.AVE RAGE HT.	MAX. CAP
3	.376	.375	.11	1.178	.262	.015	.143
4	.668	.500	.02	1.571	.350	.020	.191
5	1.043	.625	.31	1.963	.437	.028	.239
6	1.502	.750	.44	2.356	.525	.038	.286
7	2.044	.875	.60	2.749	.612	.044	.334
8	2.670	1.000	.79	3.142	.700	.050	.383
9	3.400	1.128	1.00	3.544	.790	.056	.431
10	4.303	1.270	1.27	3.990	.889	.064	.487
11	5.313	1.410	1.56	4.430	.987	.071	.540
14	7.650	1.693	2.25	5.320	1.185	.085	.648
18	13.600	2.257	4.00	7.090	1.580	.102	.864

1.18.4 Mechanical Properties of Reinforcing Bars

The material shall conform to the requirements for tensile and percentage of elongation properties as presented in Table-2

TABLE 2: TENSILE REQUIREMENTS

	GRADE 40	GRADE 60
Tensile Strength Minimum (in psi)	70,000	90,000
Yield Strength Minimum PSD	40,000	60,000
Elongation in 8 Piece. (in %age)	%age	%age
Bar No.		
3	11	9
4	12	9
5	12	9
6	12	9
7	11	8
8	19	8
9	9	7
10	8	7
11	7	7

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1.18.5 Bending Requirements

The bend-test specimen shall stand being bent around a pin without cracking on the outside of the bent portion. The requirements for degree of bending and size of pins are prescribed in Table-3.

Bar Designation No.	Plain Diameter for "Bend Test d-nominal diameter of Specimen	
	Grade-40	Grade-60
3,4,5	4d	4d
6	5d	5d
7,8	5d	6d
9,10,11	5d	8d

"Test bends 180° unless noted otherwise.

1.18.6 Permissible Variation in Mass

The permissible variation shall not exceed 6 percent under nominal mass. Reinforcing bars shall be evaluated on the basis of nominal masses. In no case shall the over weight of any bar be the cause for rejection.

1.18.7 Finish

The bars shall be free of injurious defects and shall have a workmanlike finish. Rust, seams, surface irregularities, or mill scale shall not be cause for rejection, provided the weight, dimensions cross-sectional area, and tensile properties of a hand wire brushed test specimen are not less than the requirements of this specification.

1.18.9 Plain Mild Steel BARS

Unless otherwise specified, all plain reinforcing bars shall comply with the requirements of B.S. -785 for plain mild steel bars and shall have a minimum yield strength (characteristic strength) of 36,000 lbs/inch sq.ft.

1.19 POLYSTYRENE (Thermo pore)

The material shall be of approved manufacture and of best quality available in Pakistan. The Polystyrene shall be of the type used for insulating roof.

The insulation shall conform to the following physical requirements:

Density (Average) kg. per M ³	37
Specific Gravity (Average)	0.12
Flexural Strength (Average Kgm per Sq. Cm.)	3.6 to 4.3
Impact Strength (Cm/Kgm per Sq. Cm.)	0.3 to 0.7
Compressive strength (Cm/Kg per Sq. Cm.)	0.17 to 1.44
Deflection (Average)	

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SECTION - 1: MATERIAL

Thermal conductivity (Average).	0.25 to Inches
Maximum BTU at mean temperature 10 Degree F.	0.22

1.20 HOLLOW FLUSH SHUTTERS (COMMERCIAL PLY) BOTH SIDES

Hollow flush doors of approved manufacturers and of best quality available in Pakistan or as approved shall be used.

The ply wood shall be in accordance with the requirements of B.S. 1455: 1963.

1.20.1 Glue

For joints work enamel glue complying with B.S. 745, Casein glue complying with B.S. 745 and cold setting Casein glue complying with B.S. 1204 shall be used.

1.21 TERMITE PROOFING MATERIAL

Termidor / Biflex / Dürbbin another approved shall be used as per manufacturer Specifications.

1.22 HARD BOARD

1.22.1 General

- The hard board shall be of approved manufacturer. It shall be hard and stout and shall not warp in moist climate nor turn into laminations. Shall be free from cracks, flaws, dents, etc. shall be sufficiently thick to support the weight it has to take where being used. It shall have uniform colour and thickness and shall have an average density of 30 to 50 lbs per cft.

1.23 CHIP BOARD

1.23.1 General

The Chip Board in general shall be medium density of best quality available in the country and shall have uniform texture and thickness conforming to B.S. 2604 : 2604. The surface shall be of such nature so as to give good adhesion to the decorative lamination to be pressed on to it. They should be free from flaws, cracks, or any sort of weak spots. The density shall be in the range of 50-53 lbs/sft and the modulus of rupture shall be between 1,500 to 3,000 lbs/sq.in.

1.23.2 Samples

The samples shall be submitted by the contractor for approval before placing order to the supplier and these samples will be retained till the completion of work. The cost of such samples shall be deemed to be included in the unit rates of the relevant items entered in the Bill of Quantities.

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PLUMBING AND SANITARY FIXTURES1.24 WATER CLOSET1.24.1 Source

Unless otherwise specified the water closet shall be of best quality manufactured in Pakistan approved.

1.24.2 Composition

The water closet shall be made of ceramic ware in one piece of material.

1.24.3 Quality

Each water closet shall show good workmanship without dents or faults. The surface and colour shall be uniform, non-corrodible, free from discoloration and imperfections.

1.24.4 Colour

The colour of the water closet shall be white or as approved.

1.24.5 Type

The colour of the water closet shall be Asian / European as specified in the drawings or as approved.

1.24.6 Size

The size of the water closet shall be as specified in the drawings or as approved.

1.24.7 Trap

The trap shall be either S or P type as approved. For manufacture and quality it shall conform to the above specification for water closet. Each trap shall have a circular opening of 0.02 meter (4") I.D. for connection of anti-siphonage pipe.

1.24.8 Foot Rest

For squatting/Asiatic pattern type water closet the foot rest shall be an integral part of the water closet.

1.25 SEAT1.25.1 Source

Unless otherwise specified the seat shall be in double seat cover comprising a seat and a cover hinged together of best quality manufactured in Pakistan or as approved.

1.25.2 Composition

Seat shall be as per manufacturer's Standard.

1.25.3 Quality

Seat shall be made in one piece. It shall be free from blisters. The surface shall be highly polished impervious and hygienic.

Signature _____

Contact M/S _____

Seal _____

1.25.4 Type

- — Seat shall be of closed or open pattern as per manufacture's Standard.

1.25.5 Shape

The shape of the seat shall be in conformity with the type water closet specified. The underside of the seat shall be flat and shall not be recessed. For closed pattern seat the hinging devices shall be either of good quality non-ferrous metal or any other corrosion resistant material.

1.25.6 Bolts

The bolts shall be of non-ferrous material 65 mm (2- 1/2") in length. Two bolts shall be provided with each seat.

1.25.7 Buffers

Seat shall be provided with rubber buffers of 25mm x 37mm (1" x 1-1/2") size and 9.5mm x 3/8") thickness. The buffers shall be rigidly attached to the seat. The metal in contact with buffers shall be non-ferrous. The cover of the seat for closed pattern shall have buffers not less than two in number.

1.25.8 Colour

The colour of the seat shall be black or as approved.

1.26 FLUSHING CISTERN**1.26.1 Source**

Cistern shall be obtained from approved source which shall be of the best quality manufactured in Pakistan or as approved.

1.26.2 Composition

Low level non-completed coupled cistern shall be made of plastic or ceramic war in one piece of materials. For manufacture and quality it shall conform to Specifications of water closet.

1.26.3 Capacity

The capacity of the cistern shall be 13.5 liters (3 Gallons).

1.26.4 Quality

Each cistern shall show good workmanship without dents or faults. The surface and colour shall be uniform free from discoloration and imperfections.

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Seal _____

1.26.5 Brackets/Bolt Kit

Brackets shall be of material as approved. The length of the bracket shall be such as to enable 100mm (4") embedding in the wall or fixed to the wall with the help of screws. Where bolt kit is available as standard Accessory it shall conform to manufacturers specifications.

1.26.6 Cover

For composition and quality the cistern cover shall conform to the corresponding specification of cistern.

1.26.7 Flush Pipe

Flush pipe shall be of 31mm (1-1/2") internal diameter. It shall be manufactured either from steel or non-ferrous materials as approved.

The steel pipe shall be either galvanized or chromium plated both internally and externally as approved. Moulded rubber cone shall be provided for connection with the water closet.

1.26.8 Ball Valve and Component Parts

Ball valve and its component part shall be either of brass or gun metal or any corrosion resistant alloy or plastic. These shall be sound, hard, smooth and well finished. The mechanism of component parts shall be such that when the position is in contact with the face of seat the short arm of the lever shall be in vertical position. Ball valve shall not leak when rested to a pressure of 210. x 103 Kg/sq. meter {300 P.S.I.} It shall not displace water more than half its volume when left in water.

1.27 WASH HAND BASIN**1.27.1 Source and Type**

Wash Hand Basins shall be of an approved best quality and type manufactured in Pakistan.

1.27.2 Composition

Wash Hand Basin shall be made as ceramic ware in one piece of material as approved.

1.27.3 Manufacture

Each Wash Hand Basin shall be fired at such a temperature as to produce a satisfactory fused clay.

1.27.4 Quality

Signature _____

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Seal _____

Each Wash Hand Basin shall show good workmanship without dents or faults. The surface and colour shall be uniform non-corrodible, free from discoloration and imperfections.

1.27.5 Colour

Colour of the wash hand basin shall be white or as approved.

1.27.6 Size

The size of the wash hand basin shall be as specified in the Bill of Quantities.

1.27.7 Overflow

Overflow shall be either of open ware type with removable grating or of a bolt type as specified. The slot for overflow shall be 63mm long 12.7mm deep (2.5" long ½" deep). It shall be so designed as to facilitate cleaning.

1.27.8 Soap tray or Sinking

Soap tray or sinking shall be so provided as to drain into the basin.

1.27.9 Tap Holes

The tap holes shall be squarer of fit pillar taps and shall be beveled around the opening. They shall be so situated as to allow supply pipes to be clear of waste and vent pipes and shall have enough space to prevent the user striking the head on the tap.

1.27.10 Waste Hole and Grating

Waste hole shall have a minimum diameter of 63mm (2.5"). The outlet shall be beveled or rebated. The tap hole shall be square I shape and each side shall be of 29mm (1.1/8") length. Chromium plated grating of a appropriate diameter shall allow free drainage of water and be securely fitted to basin without any leakage.

1.27.11 Plug Chin and Stay Hole

Plug shall be of rubber. The diameter of the plug shall be such as to fit snugly in the waste hole. The chin shall be of brass/chromium plated one end fixed to the plug and the other end in the chin stay hole. The position of the stay hole shall not be lower than the over flow slot.

1.27.12 Brackets

Brackets shall be of an approved material. The length of the bracket shall be such as to enable 100mm (4") embedding in the wall or fixed to the wall with the help of screws.

1.27.13 Stud Slots

Stud slots shall be monolithically cast with the wash hand basin. These shall receive the brackets on the inside of the basin and shall be so situated that the brackets remain 50mm (2") away from the face. These shall not exceed 12.7 mm (½") in dia 7.9 mm

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(5/10") in height and shall be 300mm (12") from the back of the basin to the center of the side. The side studs shall be 63mm x 125mm x 16mm (2-1/8" x 5" x 5/8") and centre of stud shall be 300mm (12") from the back of the basin.

1.28 WASTE PIPE

Waste Pipe shall be of 38mm (1-1/2") internal diameter. It shall be PVC painted with enamel paint, or chromium plated as specified in the BOQ.

1.28.1 Bottle Type Trap

- All the wash hand basins shall be provided with a bottle type trap (Chromium plated or stainless steel as approved) and connected with the basin and waste pipe.

1.29 TOOTH BRUSH HOLDER WITH TOOTH PASTE DISH

1.29.1 Source and Type

Tooth brush holder with tooth paste dish shall be of best quality and type manufactured in Pakistan as approved.

1.29.2 Composition

It shall be made of Stainless Steel.

1.29.3 Quality

Each tooth brush holder shall be of best quality and show good workmanship. The surface and colour should be uniform, non-corrodible, and free from discoloration and imperfections.

1.29.4 Size

Size of the tooth brush holder shall be as approved.

1.30 SINK

1.30.1 Source and Type

Sink shall be of best quality and type manufactured in Pakistan and as approved.

1.30.2 Composition

It shall be made of 18 gauge stainless steel or as approved.

1.30.3 Quality

Each sink shall show good workmanship without dents or faults. The surface and colour should be uniform non-ferrous free from discoloration and imperfections.

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1.30.4 Size

Size of the stainless steel sink shall be as specified in the Bill of Quantities or as approved.

1.31 PILLAR COCK**1.31.1 General**

Pillar Cock shall be chromium plated and of best quality manufactured in Pakistan. These shall be of screw down type with jam nut. Internal diameter of the tap shall be 15mm (1/2").

1.32 ONE HOLE MIXER**1.32.1 General**

- a] One hole mixer for wash basin.
- b] One hole mixer high cock for sink.

One hole mixer shall be chromium plated and of best quality manufactured in Pakistan. These shall be of screw down type with jam nut. Internal diameter of the tap shall be 13mm (1/2").

1.33 URINALS

Urinal shall be of best quality manufactured in Pakistan and as approved.

1.33.1 Composition

Urinal shall be made as a ceramic ware in one piece of material as specified.

1.33.2 Manufacture

Each urinal shall be fired at such a temperature as to produce a satisfactory Fused Clay.

1.33.3 Quality

Each urinal shall show good workmanship without dents or faults. The surface and colour shall be uniform free from discoloration and imperfections.

1.33.4 Colour

Colour of the urinal shall be white or as approved.

1.33.5 Flushing Cistern

4.5 liters capacity automatic C.I. cistern best quality local made enamel painted or Ceramic type best quality local made as specified in the Bill of Quantities.

Signature _____

Contact M/S _____

Seal _____

1.33.6 Type

The type of the urinal shall be as approved.

1.33.7 Waste Pipe

Waste pipe shall be of 38 mm (1-1/2"O internal diameter. It shall be manufactured either from steel or non-ferrous materials as approved. The steel pipe shall be either galvanized (internally and externally) or chromium plated as approved.

1.33.8 Brackets

Brackets shall be painted iron. The bracket shall be either of such a length as to enable 100 mm (4") embedding in the wall or shall be such as to be fixed to the wall with the help of screws.

1.34 TAPS AND STOP COCKS (TEE ANGLE ETC)**1.34.1 Source**

Taps and cocks shall be of best quality manufactured in Pakistan and as approved.

1.34.2 Composition

The bodies and heads shall be of hard brass or gun metal or hot pressings of brass or manganese bronze. Spindles, glands, crutches, washer plates and nuts shall be of brass or manganese.

1.34.3 Quality

Castings shall be from metal poured into the moulds while hot pressing shall be metal pressed between dies.

Pressing shall be smoother and shall present a better appearance. These shall be plated with zinc or chromium as specified.

1.34.4 Requirements

Tap and cocks shall be fitted with a cover of pressed sheet metal threaded for attachment to the head and which can be cleaned easily. The stem of washer, plate (called a jumper) shall be either loose or fixed by screwing to the spindle with the help of a grub screw.

1.34.5 Size

Size of the taps and cocks shall be as specified or as approved.

1.35 C.P. SHOWER AND C.P. ARMS**1.35.1 Source and Type**

The C.P. Shower with arms shall be of an approved best quality and type manufactured in Pakistan.

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Seal _____

1.35.2 Composition

It shall be made of best quality materials duly chromium plated in accordance with the latest specifications as approved.

1.35.3 Quality

It shall be of quality and show good workmanship. The surface and colour should be uniform non-corrodible discoloration and imperfections.

1.35.4 Size

The C.P. shower shall be from an approved manufactured and of the sizes specified.

1.36 C.P. SOAP DISH**1.36.1 Source and Type**

C.P. Soap dish shall be of an approved best quality and type manufactured in Pakistan.

1.36.2 Composition

It shall be made of best quality materials duly chromium plated in accordance with the latest specifications as approved.

1.36.3 Quality

It shall be of best quality and show good workmanship. The surface and colour should be uniform non-corrodible, free from discoloration and imperfections.

1.36.4 Size

The size of the C.P. Soap dish shall be as approved as specified.

1.37 C.P. TOILET PAPER HOLDER**1.37.1 Source and Type**

The C.P. Toilet Paper holder shall be of an approved best quality and type manufactured in Pakistan.

1.37.2 Composition

It shall be made of best quality material duly chromium plated in accordance with the latest specifications as approved.

1.37.3 Quality

It shall be of best quality and show good workmanship. The surface and colour should be uniform non-corrodible, free discoloration and imperfections.

Signature _____

Contact M/S _____

Seal _____

1.37.4 Size

The size of the toilet paper holder shall be as approved or as specified.

1.38 C.P. TOWEL RAIL1.38.1 Source and Type

C.P. Towel Rail shall be of an approved best quality type manufactured in Pakistan.

1.38.2 Composition

It shall be made of best quality iron pipe, duly chromium plated in accordance with the latest specifications as approved.

1.38.3 Quality

It shall be of best quality and show good workmanship smooth surface and colour should be uniform non-corrodible, free from discoloration and imperfections.

1.38.4 Size

It shall be of 3/4" dia x 24" long (19mm x 600mm) long.

1.39 MIRROR1.39.1 Source and Type

Mirror shall be of best quality Belgium or local as specified make with Chromium plated screws.

1.39.2 Composition

It shall be made of best quality materials in accordance with the latest British Standard Specifications as approved.

1.39.3 Quality

It shall be of best quality and show good workmanship and surface should be uniform and free from imperfections and distortion.

1.39.4 Size

Size of the mirror shall be 24" x 1/4" or as specified.

1.40 PLATE GLASS SHELVES WITH C.P. GUARD RAILS1.40.1 Source and Type

Plate glass shelves with C.P. guard rails shall be of an approved best quality and type manufactured in Pakistan.

Signature _____

Contact M/S _____

Seal _____

1.40.2 Composition

It shall be made of best quality materials in accordance with the latest specifications as approved.

1.40.3 Quality

It shall be best quality and show good workmanship. The surface and colour should be uniform non-corrodible, free from discoloration and imperfections.

1.40.4 Size

It shall be of size 24" x 5" x 3/16" (600 x 125 x 5mm) or as specified.

1.40.5 C.P. Hanger

The C.P. hanger shall be of an approved best quality and type manufactured in Pakistan.

1.40.6 Composition

It shall be made of best quality materials duly chromium plated in accordance with the latest specifications.

1.40.7 Quality

It shall be of best quality and show good workmanship. The surface and colour should be uniform non-corrodible, free from discoloration and imperfections.

1.40.8 Size

The size of the C.P. hanger shall be as approved.

1.41 TIMBER GRILL1.41.1 Source and Type

Timber grill shall be of first class deodar wood or as specified/approved.

1.41.2 Composition

It shall be manufacture from 1st class deodar wood duly painted with 3 coats of enamel paints as approved.

1.41.3 Quality

It shall be of best quality and show good workmanship.

1.41.4 Size

It shall be of 27" x 27" x 3" (675mm x 675mm x 75mm) size or as approved.

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Seal _____

1.42. FLOOR TRAPS**1.42.1 Source and Type**

The floor trap shall be of an approved best quality and type manufactured in Pakistan.

1.42.2 Composition

It shall be of best quality cast iron in accordance with the latest specifications with C.P. Grating of specified size.

1.42.3 Quality

It shall be made of best quality and show good workman-ship. The surface shall be uniform, non-corrodible, non-ferrous and free from imperfections.

1.42.4 Size

The size of the flow trap shall be as specified or as approved.

1.43 GULLY TRAPS**1.43.1 Source and Type**

Gully-traps shall be of an approved best quality and type manufactured in Pakistan.

1.43.2 Composition

It shall be made of best quality earthenware duly glazed with 150 x 150mm cast iron gratings. A brick masonry chamber plastered with 1:3 cement sand mortar both inside and outside shall be construed over the gully trap with C.I. frame and cover of required size.

1.43.3 Quality

It shall be of best quality and show good workmanship. The surface shall be uniform free from imperfection.

1.44 It shall be made of best quality and show good workman-ship. The surface shall be uniform, non-corrodible, non-ferrous and free from imperfections.

1.44 VALVES

Air relief valves, non-return valves, gate valves etc.

It shall be made of best quality and show good workman-ship. The surface shall be uniform, non-corrodible, non-ferrous and free from imperfections.

1.44.1 Source and Type

The valves shall be heavy duty and of an approved best quality and type manufactured in Pakistan.

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1.44.2 Composition

- a) Air relief valve shall have small orifice valve, rubber balls, brass air vent orifices, gun metal nipple, screw down valve and seats, operating screws. The valve shall be capable to resist 153 meter of water pressure.
- b) Non-return valves body shall be of cast iron or bronze with gun metal seats and stainless steel hinges. The valve shall be capable to resist a pressure of 150 meter of water.
- c) Gate valves, heavy-duty type brass, gun metal or bronze of best quality, manufactured in Pakistan as approved and capable to resist a pressure of 150 meter of water.

1.44.3 Size

As per Bill of Quantities.

1.45 MANHOLE COVER AND FRAME**1.45.1 Source and Type**

Manhole cover and frame shall be of an approved best quality and type manufactured in Pakistan conforming to B.S.S 497.

1.45.2 Quality

It shall be of best quality and show good workmanship. The surface shall be uniform, non-corrodible, non-ferrous and free from imperfections.

1.45.3 Size

18" (450mm) dia weight ½ Cwt or as specified in the B.O.Q.

1.46 CAST IRON SOIL PIPES (SPUN TYPE)

- 1.46.1 Cast iron soil pipes and fittings shall be of an approved best quality manufactured in Pakistan which shall be truly cylindrical with clear internal diameter as specified having a uniform thickness smooth and with strong and deep sockets free from flaws air bubbles, cracks, and holes and other defects. They shall not be brittle but shall allow for ready cutting chipping drilling.

1.46.2 Standards

When used underground the thickness and weight of cast iron pipes shall not be less than those shown on the following table:

Internal Diameter	Weighty per 6 ft. length {including socket & headed spigot or flanges, the socket not less than 3/8" thick}
2" (50mm)	24.9 Kg.
3" (75mm)	34 Kg.
4" (100mm)	48 Kg.
6" (150mm)	70.3 Kg.

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1.46.3 Treatment

Before use all cast iron pipes and fitting shall be treated with two coats of Angus Smith composition of the Dower - Barft process or Macarlaine's glass enamel or other approved means of preventing oxidation.

1.46.4 Type

Cast iron soil pipes shall be either spigotted or socketted or flanged at both ends as specified.

1.46.5 Length

Cast iron soil pipes shall be in 6ft. (2meter) long pipes including socket and beaded spigot or flanges at both ends.

1.46.6 Plain Bend Door Bend and Plug Junction

For quality and treatment the specials shall conform to the corresponding specification of cast iron soil pipes. The size shall be as specified.

1.47 REINFORCED CEMENT CONCRETE PIPES**1.47.1 Source**

Reinforced cement concrete pipe of specified quality shall be of approved manufacturer.

1.47.2 Composition

Pipe shall be made of reinforced cement concrete. The cement concrete shall be Class - B for all Class of pipes (1:1-1/2:3).

1.47.3 Quality

Pipe shall be of uniform internal diameter and thickness throughout its length. The minimum amount of reinforcement for different diameters of pipes shall be as given in Table No. 1 and 1.1.

1.47.4 Collars and Sockets

Collars and sockets shall conform to the above specifications for composition quality and reinforcement.

1.47.5 Standard

The standard thickness, weight and reinforcement for different diameters of pipes and collars shall be as given in Table No. 1 & 2.

1.47.6 Tolerance

The internal diameter of pipe shall not deviate from the nominal internal diameter by more than 1/8" (3mm) upto 18" (450mm) diameter, 1/4" (6mm) upto 48 (1200mm)

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Seal _____

diameter. The radial thickness of the wall of pipe or its fittings shall not vary more than specified below:

Pipe diameters in inches	Variation in radial Thickness in inches.
3 to 18	± 1/16
20 to 36	± 3/32
38 to 48	± 1/8

The internal diameter of the socket or collar shall have a minimum clearance when fixed to the pipes as specified below:

Nominal Internal diameter of pipe In inches	Minimum clearance between spigot and socket or collar in inches
3 to 18	3/8
10 to 18	5/8
24 to 48	3/4

1.47.7. Hydraulic Test

Pipe barrel shall withstand the specified internal pressure without showing any sign of injury or sweating. The pressure shall be applied at a rate not exceeding 10 PSI in 5 second and full pressure shall be maintained for at least thirty seconds.

TABLE NO. 1

Diameter	Steel Reinforcement for Pipes				Steel Reinforcement for Collars			
	spirals		Straight Rod		Spirals		Straight Rod	
	Gauge	Weight per Pipe	Size	Weight per Pipe	Gauge	Weight per Pipe	Size	Weight per Collar
1	2	3	4	5	6	7	8	9

E-CLASS PIPES AND COLLARS

Inches		Lbs.		Lbs.		Lbs.		Lbs.
3	14	0.56	3/16"	2.80	12	0.07	3/16"	.36
4	12	0.76	3/16"	2.94	12	0.10	3/16"	.43
5	12	1.32	3/16"	3.03	12	1.16	3/16"	.52
6	12	1.47	3/16"	3.25	12	0.24	3/16"	.80
7	12	2.31	3/16"	5.25	12	0.27	3/16"	.67
8	12	2.75	3/16"	5.35	12	0.34	3/16"	.75
9	12	3.14	3/16"	6.4	12	0.39	3/16"	.80
10	11	3.56	3/16"	7.0	11	0.42	4G	.98
12	11	5.22	4G	10.2	11	0.85	4G	1.1
15	11	8.16	4G	15.1	10	1.2	1/2"	1.3
18	9	15.01	1/2"	16.1	9	2.28	1/2"	1.6

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M-CLASS PIPES AND COLLARS

Inches		Lbs.		Lbs.		Lbs.		Lbs.
3	14	1.81	3/16"	4.67	12	0.31	3/16"	.5
4	12	1.90	3/16"	5.0	10	0.33	1/4"	.53
5	12	2.13	3/16"	5.25	10	0.35	3/16"	.57
6	12	3.09	3/16"	5.25	10	0.39	3/16"	.65
7	12	4.97	3/16"	5.83	10	0.56	3/16"	.08
8	12	6.0	1/4"	6.0	9	0.85	1/4"	.85
9	12	6.02	1/4"	7.6	9	0.75	3/16"	.9
10	11	7.8	4G	8.5	8	1.05	4G	1.0
12	11	12.40	4G	10.2	7	1.74	4G	1.1
15	11	18.5	3G	12.1	6	2.13	1/4"	1.7
18	9	33.62	3G	18.7	6	2.24	1/4"	2.3

H-CLASS PIPES AND COLLARS

Inches		Lbs.		Lbs.		Lbs.		Lbs.
3	14	2.17	3/16"	4.67	10	0.35	3/16"	.5
4	12	3.28	3/16"	5.0	9	0.51	3/16"	.53
5	10	4.35	3/16"	5.25	9	0.63	3/16"	.57
6	10	5.87	3/16"	5.25	8	0.74	3/16"	.65
7	9	7.61	3/16"	5.83	8	0.88	4G	.8
8	9	11.27	1/4"	6.0	7	1.31	4"	.8
9	8	11.85	1/4"	7.0	7	1.46	1/4"	.9
10	8	15.87	4G	8.5	6	1.05	1/4"	1.0
12	7	24.16	4G	10.2	5	6.2	1/4"	1.1
15	6	36.8	3G	12.1	5	4.43	1/4"	1.7
18	4	66.31	3G	18.7	3	8.33	1/4"	2.3

TABLE NO. 2

R.C.G. PIPES AND COLLARS (6 FEET LENGTH)

S. No.	Bore dia Inches	A-None Pressure		B- Tested to 75- Head		C- Tested to 150- Head		D- Tested to 200- Head	
		Thickness	Weight	Thickness	Weight	Thickness	Weight	Thickness	Weight
		Inches	Lbs.	Inches	Lbs.	Inches	Lbs.	Inches	Lbs.
1.	3	1	14	1	14	1	14	1	-
2.	4	1	18	1	18	1	18	1	-
3.	5	1	21	1	21	1	21	-	-
4.	6	1	26	1	25	1	25	1	-
5.	8	1	32	1	32	1-1/2	50	1	95
6.	9	1	36	1	36	1-1/2	-	1-1/2	-
7.	10	1-1/8	42	1-1/8	42	1-1/2	60	-	62
8.	12	1-3/16	54	1-3/16	54	1-1/2	70	-	-
9.	15	1-1/4	71	1-1/4	71	1-7/8	114	-	92
10.	18	1-3/8	95	1-3/8	95	2	114	-	-

1.47 GALVANIZED IRON PIPES1.48.1 Source

Galvanized iron pipes shall be of specified quality and of an approved manufacture.

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1.48.2 Composition

Pipe shall be of best quality galvanized iron.

1.48.3 Quality

Pipes shall be sound costly workable with drill or file and free from imperfections. Its inner and outer surface shall be smooth. Each pipe shall be properly galvanized. It shall have screw threads on both ends for jointing with sockets.

1.48.4 Welding Socket

High frequency induction welding, Socket shall conform to the above specifications of galvanized iron pipes for composition and quality.

1.48.5 Requirements

All straight lengths of pipes and its threads shall be protected socket and jute covering.

1.48.6 Test

Pipes shall be capable of withstanding a pressure 700 psi. The pipes shall comply with Specification No. B.S. 1387, Clause-M.

1.48.7 Galvanized Iron Specials

The specials shall be of G.I. manufactured to the same specifications as the pipes but where these are not available locally manufactured gun metal specials can be used. It shall be ensured that the threads are not worn out. The fittings shall be tested by jointing at least 5 percent of the local supplies to straight pipes with sufficient pressure. Defective fittings invariably crack on application of pressure. The fittings shall also be hydraulically tested to a pressure of 200 ft. of water head.

1.49 FIRE HYDRANT**1.49.1 Source**

The fire hydrant shall be of an approved quality and manufacture.

1.49.2 Composition

Head valve gate and nozzle cap shall be made of cast iron. Outlet nozzle, valve seat drain valve stuffing box glands box nut and operating stem shall be of bronze or any other corrosion resistant alloy as approved.

1.49.3 Quality

The component parts of the hydrant shall be free from flaws air bubbles cracks and holes and other defects. The main valve shall be faced with rubber or leather and in

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case of slide gate tubes shall have bitumastic barrel rings. All exposed surfaces shall be painted with three coats of approved quality paint. The capacity of hydrant shall be given at hydrant top and nozzle cap. It shall be self lubricating type.

1.49.4 Requirements

The requirements of fire hydrant shall be:

- i) Pitch of the stem thread shall be such that water hammer shall not exceed working pressure.
- ii) In case the upper portion of the barrel is broken off, hydrants shall remain reasonably tight.
- iii) It shall be capable of taking a flow of not less than 150 gallons per minute.
- iv) To prevent freezing a non-corrodible drip valve shall be provided to drain the barrel when the main valve is closed. Main valve shall be faced with a yielding material such as rubber for the compression type or a bronze ring for the gate type and a seat of bronze or other non-corrodible material.
- v) Outlet threads shall conform to those used in the system.

1.49.5 Type

Type of hydrant shall be either "SUNK" or "FLUSH" as approved.

1.49.6 Size

Size of the hydrant shall be 2-1/2" dia or as specified.

1.50 EXTERNAL FITTINGS / SPECIALS

1.50.1 Source

The external fittings shall be of an approved source and quality.

1.50.2 Composition

The external fittings shall be made of cast iron.

1.50.3 Quality

Each fitting shall be of the clean diameter as specified of uniform thickness with smooth and strong spigot and socket or flanges as specified. It shall be free from flaws and air bubbles, cracks and holes and other defect.

1.50.4 Standard

Each fitting shall conform to the respective standards.

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1.50.5 Size

Size of each fitting shall be as specified or approved.

1.51 JUMBOLON1.51.1 Source

Jumbolon of specified quality shall be of approved manufacture best quality available in Pakistan. The Jumbolon shall be of the type used for insulating roof.

The insulation shall conform to the following physical requirements.

• All Structure	Closed very fine
• Density	26-32 kg / M3 (ISO 845 1988 E)
• Chemical Resistance	Excellent (ASTM 547)
• Temperature Range	-80 to +85 °C
• Flexibility	Good (BS 4433)
• Ozone Resistance	Excellent (ASTM D1171 & BS 5173)
• Thermal Conduct	K-CAL / H.M2C 0.030 Bta / hr ft2 F 0.207
• Vapom Barium	Excellent
• Flammability	Self Extinguishing
• Smoke Density	Class A (ASTM E-84)

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2.1 DESCRIPTION

The work to be done under this section consists of dismantling and demolition of existing structure (if any) including clearing out site of all rubbish, grass, shrubs, brush wood, under growth, roots and trees.

Securing permanent bench marks at given levels and grades wherever required. General grading and leveling of the site to achieve a proper drainage.

Removing all construction or demolition debris after completion of the work as required by the local authorities.

All bench marks pegs, flags, pillars or any similar item and labor required for the setting out of the work shall be arranged by the Contractor.

No tree shall be cut without the written orders. The wood obtained shall be neatly stacked and handed over to the Employer or his representative.

The ground shall be leveled and graded in accordance with the plans, sections or in the absence of such drawings as may be directed.

2.2 CONSTRUCTION REQUIREMENTS

2.2.1 Demolition / Dismantling Work

During demolition or dismantling the Contractor shall see that no damage or injury is done to the parts of the work which are to be retained, and that the demolition is executed with appropriate tools and in such a manner as to render unserviceable as little of the materials as possible and parts of the works which are to be retained are not damaged.

Boards, battens, frames and wood work, sheets, tiles, slates, trusses, R.S. beams and all such materials likely to be damaged if dropped from a height, shall be carried to the ground or lowered with ropes.

2.2.2 Dust Prevention

To minimize nuisance from dust, arrangements shall be made for the erection and removal of screens or canvas or other suitable material and for watering the work as the demolition proceeds.

2.2.3 Sorting and Removal

All dismantled materials shall be property of the Employer and shall be sorted and stacked where ordered. Doors and windows shall be removed from the chowkhats with their hinges before dismantling the later. The work of removing dismantled material with in site area, sorting and stacking the same will be done within the rate.

2.2.4 Disposal

As required, the Contractor shall remove the whole or a portion of dismantled material from the site of work. The method of disposal of such material shall be subject to approval.

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2.3 MEASUREMENT

The measurement for clearance of site and layout of Buildings construction of bench mark and dismantling of the existing structure and works etc shall not be made separately.

2.4 RATE AND PAYMENT

The cost clearance of site, layout of Building dismantling of the existing structures and works etc shall be deemed to have been included in the rates of other items in the Bill of Quantities.

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3.1 DESCRIPTION

The work under this Section consists of excavating, in all types of soil, lifting, transportation and disposal of the excavated material, back-fill and fill for building foundations, and under floors including all incidental work necessary for excavation to the required depth and dimensions and in accordance with the Drawings or as directed. The work shall be carried out in complete conformity with the specifications set forth hereunder:

All fill or refill around structures, i.e. within the slopes and limits of the established lines for excavation for the structures and below the nature surface level, surface level, shall be defined as "Back Filling"

All fill or refill (from the excavated earth at site) about structures, i.e. above the natural surface level shall be defined as "filling under floors or embankment from excavated spoil".

All fill or refill, from the material provided and brought from outside the site (any lead), about structures, i.e. above the natural surface level shall be defined as "filling under floors with earth provided and brought from outside".

Filling shall be approved selected material from excavated or other predominantly granular material, free from slurry and organic or other unsuitable matter and capable of compaction by ordinary means.

Filling around pipes and cables shall be carefully placed; fine material shall cover the pipe or cable completely before the normal filling is place.

Material for back-filling shall conform to the requirements of Specifications. It shall be placed on layers of 6" and saturated with sufficient water or otherwise compacted to produce not less than 95 percent in situ density with respect to the maximum density at optimum moisture content, achieved in Test No. 12 of B.S. 1377 - 1967.

Filling shall not be placed against foundation walls without first obtaining approval to do so. Filling shall be brought up evenly on each side of the walls as far as practicable. Heavy equipment for spreading and compacting the fill shall not be operated closer to the wall than a distance equal to the height of the fill above the top of footing.

3.1.1 Setting Out

Lines and levels shall be set out by the Contractor who shall be responsible for maintaining all stakes and witness points set up for the work in strict accordance with the requirement and drawings.

3.1.2 Cleaning

All areas requiring clearing shall be cleared of all trees, bushes, rubbish and other objectionable matter and such material shall be removed from the site of work or otherwise disposed off as approved. Any damage to the works of public or private

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SECTION - 3: EXCAVATION, FILLING, BACKFILLING & DISPOSAL

property caused by Contractor's operation shall be made good through repair or replacement at the sole expenses of the Contractor.

3.2 AUTHORIZED OUTLINES

Unless otherwise specified or directed in writing, all earthwork, i.e. excavation of trenches, pits, etc. for foundations, filling under floors, etc. shall be executed to the widths, depths, lengths, alignments grades and levels shown on the drawings. If they are not indicated on the drawings then the Contractor shall prepare the drawing showing the existing ground levels and the actual grades and levels of excavation for obtaining approval.

Similarly for all backfill and fill works the Contractor shall prepare drawings showing the existing ground levels and the actual finished level to ascertain the volume of fill for obtaining approval before the commencement of work.

3.3 CONSTRUCTION REQUIREMENTS

3.3.1 Excavation in Foundations & Backfilling

i) Lines and Grades

The bottom and side slopes of excavation upon or against which structures or other required constructions are to be placed shall be finished accurately to the required grades and dimensions and, if required, shall be moistened with water and tamped or rolled with suitable tools or equipment for the purpose of forming firm foundation. Whenever the natural foundation material is disturbed or loosened or excavated beyond the approved lines and grades the loose material shall be removed and the extra excavation made good at Contractor's expense with selected materials which shall be thoroughly compacted by tamping rolling in layers not exceeding 6" (150 mm).

ii) Location for Placing Excavated/Surplus Materials

The excavated/surplus earth shall not be heaped within 5 ft. (1.5 m) of top edge of any foundation. The surplus material shall be disposed off within the site without any additional cost.

iii) Inspection of Foundations

Foundation trenches shall be inspected and approved before foundation is laid. If safe foundation could not be obtained at the depth shown on the drawings or at maximum depth of five feet below the ground level, the work shall be carried out as directed. Additional Cost if any shall be paid in accordance with the provisions of the Conditions of Contract.

iv) Excavation to be Kept Free From Water

All excavations shall be kept free from water from whatever source it may come at all times except where otherwise specified or permitted in writing.

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SECTION - 3: EXCAVATION, FILLING, BACKFILLING & DISPOSAL

v) Excess Excavation

In the event of any excavation being carried out wider or deeper than shown on the drawings, it shall be filled in by the Contractor at his own expense to meet the required dimension and levels with concrete or any other material approved for such purpose.

vi) Planking and Strutting

The Contractor shall provide at his own expense all timbering, piling, shoring, strutting and other approved supports to the sides of all excavation, trenches and all other works in such a way as will be sufficient to secure them from falling and to prevent any movement. The Contractor shall submit his proposals with drawings/sketches for approval prior to execution of any such construction work. All precautionary pecuniary and other responsibilities connected with this part of the work shall rest with the Contractor.

In removing timbering, shoring and strutting and all other supports from excavation and trenches etc. special care shall be taken to avoid bringing pressure to bear on any concrete or other work until it has hardened sufficiently to resist such pressure.

vii) Classification of Material

No classification will be made for payment purposes of any material excavated as to its class, nature, origin or condition, unless an unusual obstruction or embedded matter or substance is encountered. If this occurs, it shall be submitted by the Contractor for evaluation of design and working out of a necessary treatment. New items shall be mutually agreed.

viii) Transportation of Materials

All carts, trucks or other vehicles used by the Contractor for transportation of the material shall be suitably constructed or lined out to permit any leakage of soil while the vehicles are on the move. These would be so loaded and arranged as not to spill on the site and public roads. Whenever any vehicle so used is found leaking and unsuitable it shall be immediately withdrawn from the work.

ix) Termite Control

The approved foundation trenches shall be treated with the termite control solution as provided under section "Termite Control".

x) Planking and Strutting

It comprises returning, transportation and filling the selected excavated material around foundations and at back of walls etc., upto finished levels shown on the drawings or as required in layers not exceeding 6 inches carefully rammed and consolidated (with addition of water if required) so as to achieve a minimum

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SECTION - 3: EXCAVATION, FILLING, BACKFILLING & DISPOSAL

relative density of 90%. No filling shall be made until the concrete foundations and footings etc., have been inspected and approved. Earth to be used for filling must be free of all the organic impurities, debris or any other foreign matter. Earth which contains more than 1% of salts, particularly sulphate, will not be used in filling.

In case of non-sufficiency of excavated material and unsuitability of earth for back-filling, appropriate material conforming to the Specifications requirements shall be brought by the Contractor. Necessary Laboratory tests shall be carried out at the Contractor's expense.

3.4 EARTH FILLING UNDER FLOORS

Excavation of Works

After the masonry has been laid upto the plinth level and the Damp Concrete Proof Course, if required is laid the space between the walls shall be cleared of debris and loose earth shall be laid in layers of 6" (450 mm) and each layer watered and compacted until the filling is completed upto the base level of the floor as shown in the drawings. Only sandy soil free from saltpeter either from the materials excavated from the foundations if such materials is suitable and sufficient or suitable material brought from outside shall be used.

3.5 SAND FILLING UNDER FLOOR

Unless otherwise specified the base of all ground floors shall be constructed in accordance with the following specifications:-

- a] Sand filling shall be done in layers not more than 4" (100 mm) thick and shall be rammed after saturation to such an extent that 4" (100 mm) layer is reduced to about 2.7" (68 mm) after compaction.
- b] The required in situ density w.r.t. maximum density to optimum moisture content shall be in compliance with test 12 of B.S. 1377 - 1967.
- c] Sand shall conform in all respect to the specifications for fine aggregate except for its grading, i.e. it shall pass through a sieve No. 16 and not more than 30% shall pass through a sieve No. 100.

3.6 MEASUREMENT

a] For Excavation

✓ The measurement shall be made for the actual Net quantity as per the approved drawings in cu. ft/m by taking measurements of trenches, pits, etc.

b] ✓ For Backfilling

The Measurement in Cu. ft/m shall be made for the actual quantity back-filling as per approved drawing of the rammed/compacted earth.

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SECTION – 3: EXCAVATION, FILLING, BACKFILLING & DISPOSAL

c] **For filling Earth/Sand under Floors**

Measurement shall be made for actual quantity as per approved drawings in Cu. Ft/m by measurement of the rammed/compacted earth.

3.7 RATE AND PAYMENT

a] **For Excavation**

Payment shall be made for the actual quantity of excavation as measured above in Cu. Ft/m at the corresponding unit rate of BOQ. The rate for excavation shall cover:

Item rate include excavation, back-filling any section of the work, lifting and removal of surplus/excavated material for all leads and lifts;

The provision of drainage of surface subsoil/ground water and rain water in order to prevent accumulation of water around the foundations during the construction period. If a situation necessitates the execution of drainage, it shall be carried out by the Contractor at no extra cost. The duration of such activity shall be as per construction requirement or as directed.

- b] Payment for the earth brought from out side source if required on approved of the Engineer shall be made for actual quantity of the compacted earth filling in Cu. Ft/m at the correspondence unit rate of B.O.Q. The rate fro the earth filling shall cover, cost of the fill material, carriage, lifting, loading, unloading, compacting, curing etc.

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4.1 DESCRIPTION:

The work consists of providing termite control treatment in foundations plinth and under floors with the solution or another as approved Termidor, Biflex, Durbbbin or protect.

4.2 MATERIAL REQUIREMENTS:

Pesticide shall be of approved manufacturers and shall be brought at site in manufactures sealed tins.

4.3 CONSTRUCTION REQUIREMENTS:**4.3.1 Extent of Application:**

Unless otherwise specified all sides of structural members below floor level and bottoms of excavated trenches/pits, floors beds and underside of plinth protection are to be sprayed with the solution.

4.3.2 Preparation of Solution:

A solution shall be prepared as per instruction of the manufacturer.

4.3.3 Method of Application:

The solution shall be applied with approved pressure spraying equipment maintaining and adequate pressure to all application to, on or in the earth. Solution shall also be sprayed in trenches around the building under plinth protection. Pesticide shall penetrate to a depth of 25 mm (1") minimum in porous earth at sides and 50 mm (2") to 75 mm (3") at bottoms of excavation and floor beds. After back-filling to plinth level, the area is again to be sprayed with pesticide locution. Wherever wooden/ply surfaces are to be treated by spraying, it shall be carried out with approved hand compression sprayer at the specified pressure as per instructions.

4.3.4 Rate of Application:

As per instruction of the manufacturer.

4.3.5 Precaution:

The contractor shall take extreme care to avoid any mishap due to the injurious effects of the chemicals and shall keep the "Owner" indemnified from any losses, damages or expenses in this connection whatsoever.

4.4 MEASUREMENT AND PAYMENT

The measurement shall be made in sq. m/sq. ft. by measuring and multiplying length into breath/height/depth of the actually treated surface by spraying the solution.

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4.5 PAYMENT:

The payment shall be made in sq. m/sq. ft. of the actual work done as measured above at the corresponding unit rate given in BOQ.

Note: The General Contractor has to engage an approved Specialist Contractor for the purposes of Termite proofing 07 years Guarantee as approved by the Employer / Engineer.

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5.1 DESCRIPTION

This item covers the manufacture, forming, transporting, placing, and stripping of forms, finishing and curing of plain and reinforced normal concrete in the structures included herein.

5.2 SPECIFICATION

Concrete work shall conform to all requirements of ACI 301-72, (Revised 1975), Specifications for Structural Concrete for Buildings, except as modified by supplemental requirements below. The Contractor shall submit, for approval before commencement of any work, his Method Statement which would provide complete details of the procedures and equipment to be used for the satisfactory execution of the work.

5.3 COMPOSITION AND QUALITY

Concrete shall be composed of port-land cement, water, fine and coarse aggregates and any admixtures as and when specified. The concrete mixtures will be designed by the Contractor who will determine the required quality of the concrete for the structures covered by these Specifications. The desired strength of concrete for various parts of the structure have been shown of the Drawings.

5.4 CEMENT**5.4.1 General:**

Cement shall be furnished in sacks or in bulk form as approved. Unless otherwise permitted, cement from not more than two plants shall be used and in general, the product of only one plant shall be used in any particular section of the work. No cement recovered through cleaning sacks shall be used.

5.4.2 Portland Cement:

Portland Cement shall be indigenous staff unless otherwise approved. Portland cement shall conform to British Standard 12:1971, Specifications for Portland Cement or to ASTM Designation C 150-74, Standard Specifications for Portland Cement Type-I conforming to ASTM Designation C 150-74, Type - II or IV may also be used in certain parts of work as specified.

5.4.3 Tests:

Cement shall be sampled at storage site and tested from time to time in accordance with the ASTM Designation C 150-75 or its equivalent British Standards. Expenses for such tests shall be borne by the Contractor. If the tests prove that the cement has become unsatisfactory, it shall be removed from the site immediately. Cement which has been in storage longer than four months shall not be used until re-testing proves it to be satisfactory.

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5.4.4: Transportation of Cement:

Transportation of the cement from the mill to the site stores and to the point of use shall be accomplished in such a manner that the cement is completely protected from exposure to moisture. Cement which has been adversely affected by moisture shall be rejected. Cement in sacks shall be delivered in strong, well made, paper or cloth bags, each plainly marked with the manufacturer's name, brand, type of cement and the weight of cement contained therein. Packages varying more than 3 percent from the weight marked thereon may be rejected and if the average weight of packages in any consignment as shown by weighing fifty packages taken at random is less than that marked in the packages, the entire consignment may be accepted only as fractional packages.

5.4.5 Storage:

Cement shall be stored in dry, weather light and properly ventilated structures. All storage facilities shall be subject to approval and shall be such as to permit easy access for inspection and identification of each consignment. Adequate storage capacity shall be furnished to provide sufficient cement to meet the peak needs of the project. Cement in sacks shall be stored on a damp proof floor and shall not be piled to a height exceeding 6 feet.

The Contractor shall use cement in the approximate chronological order in which it is received at the site. All empty sacks shall be promptly disposed off.

Cement storage facilities shall be emptied and cleaned by the Contractor when so directed, however, the interval between required cleaning normally will not be less than four months.

Suitable, accurate scales shall be provided at site for weighing the cement in stress and elsewhere in the work, if required, and he shall also furnish all necessary test weights.

5.4.6 Delivery and Usage Record:

Accurate records of deliveries of cement and its use in the works shall be kept by the Contractor. Copies of these records shall be supplied in such a form as may be required.

5.5 AGGREGATE**5.5.1 Requirement**

Aggregates for normal concrete shall conform to the ASTM Designation 'Concrete Aggregates'. Following tests shall be carried-out at the Contractor's cost to determine suitability of the material for the intended use.

- a) Mechanical properties
- b) Porosity

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- c] Organic impurities
- d] Clay and Silica Contents
- e] Abrasion and Soundness Tests
- f] Alkali Re-activity Potential
- g] Water soluble Chloride Contents.

The nominal maximum size of the aggregate shall be larger than one fifth of the narrowest dimension of the finished wall or slab, or larger than three fourth of the minimum clear spacing between the reinforcing steel and embedments. These the concrete can be place without honey-comb or voids.

5.5.2 Composition:

The use of natural sand or a combination of natural and manufactured sands may be permitted, provided that the fine aggregate meets the applicable requirements of the Specifications herein, for particular use intended. Coarse aggregate shall consist of gravel, crushed stone or a combination thereof.

5.5.3 Source:

The Contractor shall obtain concrete aggregate from deposits of natural sand and gravel or shall procure crushed aggregate from approved quarries which produce aggregates meeting the Specifications.

5.5.4 Sampling and Testing:

During construction, aggregate will be sampled and tested as delivered to the mixer to determine compliance with Specification. The Contractor shall provided facilities as may be necessary for the ready collection of representative test samples. Testing of concrete aggregates shall not relieve the Contractor of his responsibility to maintain control, to ensure the production, stockpiling and handling of both fine and coarse aggregate in accordance with these Specifications.

5.5.5 Processed Aggregate:

Aggregate, as delivered to the mixer, shall consist of clean, hard and uncoated particles. Light weight elements (chalk, clay, coal) will be separated by segregation under water by vibration (vibro-floatation process). Where required, fines shall be removed from the coarse aggregate by adequate washing. The coarse aggregate shall be re-screened just prior to delivery to the concrete mixer bins. The moisture content shall conform to the provisions of Clause 5.5.13 - Moisture Control Compliance with the aggregate grading and uniformity requirements will be determined at the mixer. All aggregate shall be sieved and washed with the clean water. The aggregates shall conform to the following specific requirements.

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5.5.6 Fine Aggregates:

The grading and uniformity of fine aggregate as delivered to the mixers shall conform to the following requirements:

Sieve Designation U.S. Standard Square Mesh.	Percent Passing
3/8 (9.5 mm)	100
No.4 (4.75 mm)	95 to 100
No.8 (2.36 mm)	80 to 100
No.16 (1.18 mm)	50 to 85
No.30 (600 mm)	25 to 60
No.50 (300 mm)	10 to 30
No.100 (150 mm)	2 to 10

5.5.7 Coarse Aggregate

The grading of the coarse aggregate within the separated size groups shall conform to the following requirements as delivered to the mixer:

U.S. Standard Sieve Size (Normal Size)	Percent by weight finer than each Laboratory Size			
	1/4" No.4 Group	3/4" to No.4 Group	1" to No.4 Group	1 1/2" to No.4 Group
2" (50 mm)	-	-	-	100
1.5" (37.5 mm)	-	-	100	95 - 100
1" (25 mm)	-	100	95 - 100	-
3/4" (19 mm)	100	90 - 100	-	35 - 70
1/2" (12.5 mm)	90 - 100	-	25 - 60	-
3/8" (9.5 mm)	40 - 70	20 - 55	-	10 - 30
No.4 (4.75 mm)	0 - 15	0 - 10	0 - 10	0 - 5
No.8 (2.36 mm)	0 - 5	0 - 5	0 - 5	-

5.5.8 Particle Shape

The shape of the particles in fine and coarse aggregate shall generally be spherical or cubical. The quantity of flat and elongated particles in the separated size groups of coarse aggregate, as defined and determined by standard tests shall not exceed 15 percent by weight in any size group. A flat particle is one having a ratio of width to thickness greater than three. An elongated particle is one having a ratio of length to width greater than three.

5.5.9 The Contractor in planning his aggregate processing operations shall make whatever provisions are necessary, as regards methods and equipment, to ensure effective elimination of soft particles from all aggregates to the degree that the percentage of soft particles present in the processed coarse aggregate shall not exceed 3 percent by weight when determined in accordance with the applicable requirements of ASTM Designation C235-68 Standard Method of Test for Scratch Hardness of Coarse Aggregate Particles or other standard test. Test Samples shall be representative of the

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each size group of processed aggregate specified in sub-clause 5.5.7 Coarse Aggregate, obtained according to the ASTM Methods D-75 Size of samples for each size group shall be as follows:

Size Group	Weight of Sample in Kilograms
1/2" to No.4	1
3/4" to No.4	1
1" to No.4	7
1-1/2" to No.410	

5.5.10 Uniformity of Coarse Aggregate:

If the Contractor prefers to use blended crushed stone and natural gravel. The uniformity of proportions of crushed gravel to natural gravel in any size group of coarse aggregate shall be maintained relatively constant and in no event exceed a variation of 5 percent plus or minus in either component of a combination of crushed and natural gravel in any 24 hours period of mixing operation, except No. 4 to 3/4" group, for which a variation larger than plus or minus 5 percent will be permitted. The limit of the larger variation will be determined after the gradation of fine aggregate has been approved and after the first month of operation of the Contractor's aggregates processing arrangements.

5.5.11 Deleterious Substances:

- a) **Fine Aggregate:** The maximum percentages of deleterious substances in the fine aggregate, as delivered to the mixer, shall not exceed the following values:

Substances	Percent of Weight
Material passing No. 200 Sieve	3
Shale	1
Total of other deleterious sub-stances (such as mica, chlorite, coated grains, and soft flaky particles).	3

The sum of the percentages of all deleterious substances shall not exceed 5 percent, by weight.

- b) **Coarse Aggregate:** The maximum percentages of deleterious substances in any size of coarse aggregate, as delivered to the mixer, shall not exceed the following-values:

Substances	Percent of Weight
Material passing No. 200 Sieve	1
Shale	1
Clay lumps	1/2
Other deleterious substances	1

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The sum of the percentages of all deleterious substances in any size, as delivered to the mixer, shall not exceed 3 percent by weight.

Storage:

Aggregate shall be stored at the site in such a manner as to prevent its deterioration or the inclusion of foreign matter. Aggregate which has deteriorated or which has been contaminated shall not be used for concrete. All methods employed by the Contractor for loading, unloading, handling and stock-piling aggregates shall be subject at all times to approval.

5.5.12 Moisture Control:

All fine aggregate and smallest size group of the coarse aggregate shall remain in free draining storage at the site for at least 72 hours immediately prior to use. The free moisture content of the fine aggregate and of the smallest size group of coarse aggregate, as delivered to the mixer, shall be controlled so as not to exceed 4.0 and 1.0 respectively, expressed at percent by weight of the saturated surface dry aggregates unless higher limits are allowed. The moisture content of the other size of the coarse aggregates are delivered to the mixers with the least amount of free moisture and the least variation in free moisture practicable under the job conditions in addition to the limits on the maximum amounts of free moisture in aggregate, the moisture content shall be controlled so that for each size the variation in the percent of free moisture will not be more than 0.5 percent during any one hour of mixing plant operation. Under no conditions shall the aggregate be delivered to the mixed plant being dripping wet.

The Contractor shall carry out such tests as deemed necessary to determine the free moisture content of aggregate.

5.6 WATER:

5.6.1 General:

Water for washing aggregates and for mixing and curing concrete shall be clean and free from injurious matters such as oil, acid, alkali, salt, organic matter, or other deleterious substances as determined by standard tests. It shall meet the following chemical requirements:

Chlorides such as sodium chloride	max	3000 ppm
Sulphate such as sodium sulphate	max	2000 ppm
Impurities	max	2 gm / liter
Melted salt	max	15 gm / liter

The water for curing concrete should not have PH value lower than 5 and shall not contain impurities which cause discoloration of concrete.

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5.7. PROPORTIONING OF CONCRETE:**5.7.1 Control:**

Trial mixes and tests will be made by the Contractor for the purpose of designing the mixes and for quality control. The Contractor shall cooperate and assist in obtaining samples and/or conducting field tests. The proportions of all materials entering into the concrete shall be as directed. The proportions will be changed whenever such change is necessary to maintain the standard of quality required for the structures covered by these Specifications and to meet the varying conditions encountered during construction. The Contractor will be entitled to no compensation additional to that included in the prices for the applicable tender items in the Bill of Quantities because of such changes.

5.7.2 Measurement:

All materials used to produce the concrete shall be measured by weight or by volume as approved.

5.7.3 Cement Content:

The cement content of concrete for various parts of the structure shall be established by trial mixes depending on the structural requirements, water cement ratio, size, type and gradation of the aggregate used. If at a particular place there is so large a quantity of steel that it becomes difficult to get the concrete well around and between it, then the specified batch of the concrete consisting of smaller size of aggregate used. If at a particular place there is so large a quantity of steel that it becomes difficult to get the concrete well around and between it, then the specified batch of the concrete consisting of smaller size of aggregate and increased quantity of cement shall be used to achieve the same strength as for normal concrete.

5.7.4 Aggregate Content:

The maximum size of aggregate to be used in the various parts of the structure shall be shown on the drawings and where not shown, shall be as directed. Concrete mixes shall be of coarse aggregate practicable in accordance with Clause 5.5.

5.7.5 Water Content:

The amount of water to be used shall be governed by the following considerations:

- i] Water Cement Ratio: In general, the design will provide for water cement ratios by weight (exclusive of water absorbed by the aggregates), which will be determined on the basis of producing concrete having suitable workability, density, impermeability, durability and the required strength without the use of excessive amount of cement.
- ii] Consistency: The amount of water used in the concrete will be regulated as required to secure concrete of proper consistency taking into account the effect

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of any variation in either or both the moisture contents or grading of the aggregated as they enter the mixer. Addition of water to compensate for stiffening of consistency from batch t batch shall be ensured.

- iii] Concrete Strength: Concrete for different part of structure shall have cylinder compressive strength at least equal to the minimum allowable strength shown in the following table except as otherwise indicated on the drawings or directed. Contractor shall submit Design mix from a approved lab at his expense for approval of the Engineer.

Class	28 days work compressive Strength (cylinder strength)/Nominal Mix
Lean Concrete	1000 psi
D	2000 psi
C	3000 psi
B	4000 psi

- iv] Slump: In general, the slump of the concrete after concrete has been deposited but before it has been consolidated, shall not exceed 4" for the structures and/or parts thereof unless otherwise directed. Check slumps shall be taken at mixer and at other locations as directed. The placement of concrete of such lesser slumps can be consolidated readily into place by means of the specified vibrations. The use of buckets, chutes, hoppers, or other equipment of types that will not readily handle and place concrete of such lesser slumps will not be permitted. The slump will be determined in accordance with ASTM Designation C143-74, Standard Method of Test for Slump of Portland Cement Concrete, except that the fraction of material larger than 1-1/2" (37.5 mm) thick be removed by wet screening.

5.8 TEST OF CONCRETE:

5.8.1 Strength Test During the Work:

Strength test of the concrete placed during the course of the work will be made in an approved laboratory at the Contractor's expense. The Contractor shall assist in obtaining such number of cylinders may be directed but in general, three sets of three cylinders and /or three sets of three beams, taken from each 100 cu.yds or fraction thereof or from each days pour, which ever is less, of each class of concrete placed, shall govern. Test specimens will be made and cured by the Contractor in accordance with the applicable requirements of ASTM Designation C31-69, Standard Method of Making and Curing Concrete Compressive and Flexural Test Specimens in the Field. Cylinders and beams will be tested in accordance with the applicable requirements of ASTM Designation C39-72, Standard Method of Test for Compressive Strength of Cylindrical Concrete Specimens and ASTM Designation C78-64, Standard Method of Test for Flexural Strength of Concrete (Using Simple Beam with Third Point Loading). The test

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result will be based on the average of the strength of the test specimens except that if one specimen in a set of three shows manifests evidence of improper sampling, moulding, or testing, the test result will be based on the average of the remaining two specimens.

The standard age of test will be 28 days, but 7 days test may be used to establish the relation between the 7-days and 28 days strengths of the concrete as established by tests for the materials and proportions used. If the strength tests of the specimens cured under laboratory controls, for any portion of the work, falls below the minimum standard at 28 days required for the class of concrete used in that portion, the proportions of the constituents of the concrete may be changed as necessary to secure the required strength for the remaining portions of the work. If the average strength of the specimens cured under actual field conditions as specified here-in-before falls below the minimum allowable strength, changes may be made in the conditions for temperature and moisture under which the concrete work is being placed and cured as may be necessary to secure the required strength.

5.8.2 Tests of Hardened Concrete:

Where the results of the strength tests of the control specimens indicate that the concrete as placed does not meet Specifications requirements or there is other evidence that the quality of the concrete is below Specification requirements, core-boring tests will be made by the Contractor in accordance with the applicable requirements of ASTM Designation C42-68, "Standard Method of obtaining and Testing Drilled Cores and Sawed Beams of Concrete". If the concrete in the structure will be more than superficially wet under service conditions, the cores shall be immersed in water for least 48 hours and tested wet. In the event that the core-boring test indicates that the concrete placed does not conform to the Drawings and Specifications measures as prescribed shall be taken to correct the deficiency. If a strength deficiency is found and is due to the Contractor's fault or negligence, the entire cost of the replacing faulty concrete will be made under applicable items of the Bill of Quantities.

5.8.3 Strength Relation:

Where cylinders are made by wet screening of concrete with aggregate greater than one and a half inches (37.5 mm) size such as three-inch (75 mm) aggregate concrete, the cylinders will be required to have a compressive test strength greater than the allowable strength shown on the drawings, to indicate that the respective concrete in place in the work has the allowable strength shown. The design will be such as that the average strength of the specimens tested be greater than the allowable strength shown on the Drawings for the three inches (75 mm) aggregate concrete. Such increments over the allowable strengths shown will be established after the mix design has been done and prior to mixing of concrete, and will be approximately ten percent.

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5.9 BATCHING AND MIXING:**5.9.1 Type and Capacity:**

All concrete shall be produced in a batch and mix plant or a mechanical mixer.

The size of batch and mix plant shall be such that the proposed arrangement shall produce sufficient quantity of concrete meeting with all the other requirements of these Specifications and the construction schedule. The batched materials shall be thoroughly combined into a uniform mixture before the addition of water. The water be added gradually and the mixers operated for adequate duration of time so as to obtain a thoroughly mixed concrete of uniform colour and quality.

5.9.2 Mixers:

Hand mixed concrete shall not be used; however, it may be allowed to be mixed in small mixers. The mixer provided by the Contractor shall be capable of combining the materials into a uniform mixture and of discharging this mixture without segregation. Mixers shall not be charged in excess of the capacity recommended by the manufacturer and shall not be recharged before completely discharging the previous batches. Excessive over-mixture requiring additions of water will not be permitted. The mixes shall be operated at a drum speed designated by the manufacturer. The mixers shall be maintained in satisfactory operating condition, and mixer drums shall be kept free of hardened concrete. Mixer blades shall be replaced when worn down more than 10 percent of their depth.

5.9.3 Water Batcher:

A suitable water measuring device shall be provided by the Contractor which will be capable of measuring water within the specified requirements for each batch. The mechanism for delivering water to the mixer shall be such that no leakage will occur when the valves are closed.

5.9.4 Location:

The concrete plant/mixer shall be installed at the site of the work at locations selected by the Contractor duly approved.

5.9.5 Arrangement:

Separate bins and compartments shall be provided for each size or classification of aggregate and port-land cement. The compartments shall be of ample size and so constructed that the materials will be separated under all working conditions. Batching equipment/arrangement shall be capable of delivering concrete within the following limits of accuracy:

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<u>Material</u>	<u>Percent</u>
Cement	+ 1%
Water	+ 1%
Aggregate Smaller than 3/4"	+ 2%
Aggregate larger than 3/4"	+ 3%

5.9.6 Cooling:

Adequate cooling facilities shall be provided to ensure that the temperature of concrete when discharged from the mixers is sufficiently low to meet the temperature requirements. Cool mixing water, ice, pre-cooled aggregate, shading the stockpiles with roofing or any other arrangements may be used to accomplish the pre-cooling of the concrete. Any such approval shall not in any way relieve the Contractor of his responsibility of placing concrete at temperature at or below the specified limits.

5.9.7 Scales:

Adequate and as approved weigh and volume batching facilities shall be provided by the contractor for the accurate measurement and control of each of the materials entering each batch of concrete. The accuracy of the weighing equipment shall conform to the requirements of applicable standards for such equipment. The weighing equipment shall be arranged so that the dials or indicators can be observed.

5.9.8 Mixing Time:

The mixing periods specified below are predicated on proper control of the speed of rotation of the mixer and of the proper introduction of the materials into the mixer. The mixing time will be increased when such increase is necessary to secure the required uniformity and consistency of the concrete. The mixing time for each batch after solid materials are in the mixer drum, provided that all the mixing water is introduced before one fourth of the mixing time has elapsed, shall be as follows:

<u>Capacity of Mixer</u>	<u>Mixing Time</u>
Up-to 2 cu. Yds.	1-1/2 minutes
3 cu. Yds.	2 minutes

5.9.9 Testing Facilities:

The Contractor shall provide a concrete compressive test machine, a set of standard sieves and other relevant control testing equipment and a working space for the

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inspector and a space suitable for use in the plastic testing of concrete and moulding of concrete tests specimens.

5.9.10 CONVEYING:

Concrete shall be conveyed from mixer to the place of final deposit as rapidly as practicable, methods which will prevent segregation or loss of ingredients and in accordance with ACI-304-73, Recommended Practice for Measuring, Mixing Transporting and Placing Concrete. Any wet batch hopper through which the concrete passes shall be conical in shape. There shall be no vertical drop greater than 6 feet except where suitable equipment is provided to prevent segregation and where specifically authorized. Belt conveyors, chutes, or other similar equipment will not be permitted either for conveying concrete except where the use of such equipment is approved in writing. Each type or class of concrete shall be visually identified by placing a colored tag or marker in the bucket as it leaves the mixing plant so that the concrete may be positively identified and placed in the structure forms in the desired position.

5.11 PLACING:

5.11.1 General:

- Concrete placing shall follow the Recommended Practice for Measuring, Mixing, Transporting and placing Concrete, ACI 304-73. No concrete shall be placed until all form-work, reinforcement, installation of parts to be embedded, bracing of forms and preparation of surface involved in the placing and the method of placement have been approved. Approval of the method of placement proposed will not relieve the Contractor of his responsibility under the Contract.

Before concrete is placed, all surfaces upon or against which concrete is to be placed shall be free from standing water, mud debris or loose material. All surfaces of form and embedded material that have become encrusted with dried mortar or grout from concrete previously placed shall be cleaned of all such mortar or grout before the surrounding or adjacent concrete is placed. The surface of absorptive materials against or upon which concrete is to be placed shall be moistened thoroughly so that the moisture will not be drawn from the freshly placed concrete. Concrete shall be worked into the corners and angles of the forms and angles of the forms and around all reinforcement and embedded items without permitting the material to its final position in the forms. The depositing of concrete shall be regulated so that the concrete may be effectively compacted with a minimum of lateral movement into horizontal layers approximately 1.5 feet in thickness. No concrete that has partially been hardened or contaminated by foreign materials shall be deposited in the structure, nor shall re-tamped concrete be used unless approved. The surfaces of construction joints shall be kept continuously wet for at least eighteen hours during the twenty four hours prior to placing concrete except as otherwise directed. All free water shall be removed and the construction joint shall be completely surface dry prior to placement of concrete. All concrete placing equipment and methods shall be subject to approval. Concrete

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placement will not be permitted when weather conditions prevent proper placement and consolidation.

Before placing concrete, care shall be taken to determine that all embedded items are properly placed as required under the Specifications and are firmly and securely fastened in place as indicated on the Drawings, or as required. Embedded items shall be free of oil and other foreign matter such as loose coatings of rust, paint, and scale. The embedding of wood or other foreign materials in concrete is prohibited.

5.11.2 Time Interval Between Mixing & Placing:

Concrete mixed in stationary mixers and transported by non-agitating equipment shall be placed within thirty minutes after it has been mixed, unless otherwise authorized. When a truck mixer or agitator is used for transporting concrete, the concrete shall be delivered to the site of the work and discharge shall be completed within 1-1/2 hours after introduction of the cement to the aggregates. The concrete shall be placed within 20 minutes after it has been discharged. In all cases, concrete shall be placed and compacted will within the initial setting time.

5.11.3 Placing Temperature:

Placing temperatures shall conform to the requirements herein specified for thin sections, moderate sections and mass concrete. Concrete shall be place at temperatures as follows:

	Thick	Thin
	Sec.	Sec.
	_____	_____
Max. Temperature	30 °C	35 °C
Min. Temperature	05 °C	05 °C

- i] THIN SECTIONS: Concrete for thin sections shall be delivered to the forms at the coolest temperature which is practicable to produce under current conditions but in no case at a temperature in excess of 32 degree centigrade. Sections to which this provision shall apply will be considered to be sections 2.3 feet or less in thickness.
- ii] MASS CONCRETE: Mass concrete shall have temperature of not more than 21 degree centigrade when placed. Mass concrete will be the one that is greater than 2.3 or less in thickness.

5.11.4 Lift in Concrete:

Concrete shall be installed in lifts or depths as shown on the drawings. The placement of concrete shall be carried on at such a rate and in such a manner that formation of cold

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joints is prevented. Slabs shall be placed in sections not exceeding 3600 sq. ft. (350 sq. m) unless otherwise authorized or directed. In walls, columns etc. lifts shall terminate such levels as will conform to structural details. Where slabs and beams are placed continuously with walls and columns, the concrete in walls and columns shall have been in place for at least three hours or for a longer period before placing concrete in the slabs and beams. The top surface of vertically formed lifts shall be generally level. The concrete in columns shall be placed in one continuous operation, unless otherwise authorized. In general, the construction joints in beams and slabs shall be located at mid span in both the directions as shown on the drawings or as authorized. The maximum differential in height between the various pours of the structure shall be as shown on the drawings or as directed.

5.11.5 Elapse Time between Placement of Lifts:

Except as otherwise approved on the basis of lift drawings submitted by the Contractor, a minimum of 72 hours shall elapse between the placing of successive lifts of walls and thin sections and 120 hours shall elapse between placing lifts of moderate sections and mass concrete. Thin sections and mass concrete have been defined in sub clause 5.11.3.

5.11.6 Time between adjacent Pours:

The time between adjacent pours shall be defined as the time elapsing from the end of the striking off of one pour to the start of placing the next pour. The minimum time elapsing between adjacent pours shall be 120 hours for mass concrete and 72 hours for all other concrete.

5.11.7 Placing Concrete through Reinforcement:

In placing concrete through reinforcement, care shall be taken that no segregation of the coarse aggregate occurs. In certain cases, like the bottom of beams and slabs the congestion of steel near the forms may make placing difficult. In such cases a layer of mortar of a composition compatible with the required concrete strength, shall be first deposited to cover the surface to a depth of approximately 5/8".

5.11.8 Vibration of Concrete:

Recommended Practice of Consolidation of Concrete, ACI 309-72 shall be followed for concrete consolidation. Concrete shall be compacted with mechanical vibrating equipment supplemented by hand-spading and tamping. In no case shall vibrators be used to transport concrete inside the forms. The vibrating equipment shall be of the internal type and shall at all times be adequate in number of units and power of each unit to properly consolidate all concrete. Form or surface vibrations shall not be used unless specifically approved. The intensity (amplitude) of vibration shall be sufficient (frequency not less than 8,000 impulses per minute) to produce satisfactory consolidation. The duration of vibration shall be limited to that necessary to produce satisfactory consolidation. Excessive surface working will not be permitted.

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5.12 FORMS:**5.12.1 General:**

Forms shall be true to line grade, mortar tight and sufficiently rigid to prevent objectionable deformation under load. Where forms for continuous surfaces are placed in successive units, care shall be taken to fit the forms over the completed surfaces so as to obtain accurate alignment of the surface and to prevent leakage of mortar. Responsibility for their adequacy shall rest with the Contractor, however, the type, shape, size, quality and strength of all materials of which the forms are made shall be subjected to specific approval. Bolts and rods used for internal ties shall be so arranged, that when the forms are removed, metal will not be less than 2" (50 mm) away from any concrete surface. Whenever form ties are used, their arrangement and spacing shall be in a regular pattern, in accordance with the dimensions of the form-work panels and as instructed. Wire ties will not be permitted where the concrete surface will be exposed to weathering and where discoloration will be objectionable. Depressions resulting from removal of the form ties shall be filled in accordance with the provisions of Clause 5.14 "Repair of Concrete". Suitable openings as required shall be provided in the form-work for the passage of piping ducts, channels etc. All forms shall be so constructed that they can be removed without damaging the concrete. All exposed joints, edges and external corners shall be chamfered 1-1/2" (27.5 mm) at 45 degrees except as otherwise shown. Internal corners shall be filleted where indicated or required. Forms to be used more than once shall be maintained in serviceable condition and shall be thoroughly cleaned before reuse.

5.12.2 Coating:

Shortly before concrete is placed, forms for exposed surfaces shall be coated with approved non staining form oil which shall not interfere with the set of the concrete nor be otherwise deleterious. After oiling, surplus oil on the form surfaces and any oil on the reinforcing steel or other surfaces requiring bond with the concrete shall be removed. Forms for unexposed surfaces may be thoroughly wetted, in lieu of oiling, immediately before the placing of concrete.

5.12.3 Removal:

The Contractor shall be responsible for ensuring that sufficient time has elapsed for the concrete to attain sufficient strength before removal of forms but no forms may be removed without prior approval. Forms shall be removed with care so as to avoid injury to concrete. Forms shall be removed as soon as practicable keeping in view the minimum time requirements, to avoid delay in water curing and to enable earliest practicable repair of surface imperfections. In order to avoid excessive stresses in the concrete that might result from setting of the forms, wood forms for wall openings shall be loosened, as soon as this can be accomplished without damage to the concrete. Forms for the openings shall be constructed in such a manner as to be removed until the strength of the openings shall be constructed in such a manner as to be removed until the strength of the concrete is such the form removal will not result in the concrete. In

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general, the approximate elapsed time before removal of forms shall be as stated below. However it should have attained a minimum of 70% of the specified work strength depending upon the type of the structure poured:

Beams and slabs 14 days

Columns and walls 36 hours

Mass Concrete 24 hours

5.13 TOLERANCES FOR CONCRETE CONSTRUCTION:

- Permissible surface irregularities for the various classes of concrete surface finish as specified in Clause 5.15 "Finishes and Finishing", are defined as finishes, and are to be distinguished from tolerances as described herein. In general, the permissible construction tolerances for reinforced concrete shall conform to the requirements of the following tables, as applicable. The specific tolerances for each structure and part therefore shall be as determined. Notations on the drawings, if indicated, of specific maximum or minimum tolerances in connection with any dimension shall be considered as supplemental to the tolerances specified herein and shall control. The Contractor shall be responsible for setting and maintaining concrete forms sufficiently within the tolerance limit so as to ensure that the completed work will be within the tolerances specified herein. Concrete work that exceeds the tolerance limits specified herein shall be remedied or removed and replaced by and at the expense of the Contractor.

1. Variation from Plumb:

- A. In the lines and surfaces of columns, piers, walls and arises: In any 10 feet of length... 1/4" Maximum for the entire length 3/4".
- B. For exposed corner columns, control-joint grooves, and other conspicuous lines:

In any 20 feet	1/4"
Maximum for entire length	1/2"

2. Variation from the level or from the grades specified:

- A. In slab soffits, ceilings, beam soffits and in arises, measured before removal of supporting shores:

In any 10 feet of length.	1/4"
In any bay or in any 20 feet of length.	3/8"
Maximum for the entire length.	3/4"

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- B. In exposed lintels, sills, parapets horizontal grooves and other conspicuous lines:

In any bay or in 20 feet of length. 1/4"

Maximum for the entire length. 1/2"

3. Variation of the linear building lines from established position in plan and related position of columns, walls and partitions:

In any bay 1/2"

In any 20 feet length. 1/4"

Maximum for the entire length. 1"

4. Variation in the sizes and location of sleeves, floor openings, and wall openings..... + 1/4"

5. Variation in cross-sectional dimensions of columns and beams and in the thickness of slabs and walls.

Minus 1/4"

Plus 1/2"

6. Footings:

- A. Variations in dimensions in plan:

Minus 1/2"

Plus 1/2"

- B. Misplacement of eccentricity:

2 percent of the footing width in

The direction of misplacement but

not more than 2:

- C. Thickness:

Decrease in specified thickness. 5-percent (%)

7. Variation in steps:

- A. In a flight of stairs: Rise 1/8"

Tread 1/4"

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B. In consecutive step:

Rise	1/16"
Tread	1/8"

5.14 REPAIR OF CONCRETE:

5.14.1 General:

Concrete that is damaged from any cause, concrete that is honeycombed, fractured, or otherwise defective, and concrete which because of excessive surface depressions, must be excavated and built up to bring the surface to the prescribed lines, shall be removed and replaced with dry-pack, mortar, or concrete as hereinafter specified. Repair of concrete shall be performed only by skilled workmen and within 24 hours of removal of forms.

5.14.2 Materials:

All materials used in the repair of concrete shall conform to the applicable requirements of the Specifications herein before stated.

5.14.3 Protrusions:

Where bulges and abrupt irregularities protrude outside the specified limits on formed surfaces not to be concealed permanently, the protrusions shall be reduced by bush hammering and grinding so that the surfaces are within the specified limits.

5.14.4 Depressions:

All fillings for depressions shall be boned tightly to the surfaces of the holes and shall be sound and free from shrinkage cracks and drummy areas after the fillings have been cured and have dried. All filling in surfaces of view shall contain sufficient white port-land cement to produce the same color as that of the adjoining concrete. Repairs shall be made with concrete filling, mortar filling, or dry-pack filling except where repairs with epoxy concrete and/or epoxy mortar are directed to be made. Concrete, mortar and dry-pack mortar filling shall each be mixed in approved proportions to produce a repair at least equivalent in strength, density and durability to the concrete in which the repair is required.

5.14.5 Concrete Filling:

Concrete filling shall be used for holes extending entirely through concrete section; for holes in which no reinforcement is encountered and which are greater than 1.1 sq. ft. and deeper than 4" (100 mm) and for holes in reinforced concrete which are greater in area than 0.55 sq. ft. and which extend beyond reinforcement.

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5.14.6 Mortar Filling:

Mortar filling, placed under impact by use of a mortar gun, may be used for repairing defects on surfaces, not exposed to view where the defects are too wide for dry-pack filling and too shallow for concrete filling and no deeper than the far side of the reinforcement that is nearest the surface.

5.14.7 Dry-pack Mortar:

Dry-pack mortar filling shall be used for filling holes having a depth nearly equal to, or greater than, the least surface dimensions; for narrow slots cut for repair of crack; for grout pipe recesses; and for ties and faster recesses as specified. Dry pack mortar shall not be used for filling holes behind reinforcement that extend completely through a concrete section. If removal of the form ties results in recesses, the recesses shall be filled with dry pack mortar provided that filling of recesses in surfaces upon or against which fill material or concrete is to be placed will be required only where the recesses are deeper than 1" (25 mm) in walls less than 1 ft. (0.3 mm) thick.

5.14.8 Surface Finishes of Patched Area:

The Contractor shall correct all imperfections on the concrete surfaces as necessary to produce surfaces that conform to the requirements specified for the adjacent area in Clause 5.15 "Finishes and Finishing". Unless otherwise approved, repair of imperfections in formed concrete shall be completed within 24 hours after removal of forms. Fins and encrustations shall be neatly removed from surfaces.

5.15 FINISHES**5.15.1 General:**

Allowable deviations from plumb or level and from the alignment profile grades and dimensions shall be as shown on the drawings or as specified in Clause 5.13. Tolerances for Concrete Construction are defined as tolerances and are to be distinguished from irregularities in finishes as described herein. The classes of finish and the requirements for finishing of concrete surfaces shall be as generally specified in this clause and as indicated on the drawings. Finishing of concrete surfaces shall be performed only by workmen who are skilled concrete finishers. Concrete will be tested where necessary to determine whether surface irregularities are within the limits hereinafter specified. Surface irregularities are classified as abrupt or gradual. Offsets caused by displaced from or misplaced from sheathing or lining or form sections; or otherwise defective form number will be considered as abrupt irregularities, and will be tested by direct measurements. All other irregularities will be considered as gradual irregularities, and will be tested by use of a template, consisting of a straight edge or the equivalent thereof for curved surfaces. The finish for concrete surfaces shall be as shown on the drawings or as directed. Interior surfaces shall be sloped for drainage where shown on the drawings or directed. Surfaces which will be exposed to weather and which would normally be level, shall slopes or level surfaces is indicated in the drawings or directed, narrow surfaces, such as tops of walls shall be sloped

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approximately 3/8" per foot. No grinding will be required on such formed surfaces other than that necessary for repair of surface imperfections.

5.15.2 Ordinary Finish:

- Ordinary finish (OF) applies to surfaces upon or against which fill material or concrete is to be placed. If unformed, the finishing operation shall consist of sufficient leveling and screeding to produce even uniform surfaces. When formed, the surfaces required no treatment after form removal except for repair of defective concrete and filling of holes left by the removal of fasteners from the end of the tie rods as required under Clause 5.14 "Repair of Concrete". Correction of surface irregularities shall be required for depressions only and only for those which exceed 1 inch when measured as described in sub-Clause 5.15.1.

5.15.3 Rough Concrete Finish:

Rough concrete finish (RC) applies to surfaces which are intended to receive tiles or cement plaster as indicated on the drawings. After consolidation and leveling of concrete to the specified tolerances, the surface shall be roughened with stiff brushes or raked before final set. Where rough concrete finish is specified for wall surfaces, the same shall be obtained by use of form-work suitable to produce the required finish. Surface irregularities measured as described in sub-clause 5.15.1 "General" shall not exceed 3/8" for floor and 2/8" for walls.

5.15.4 Ordinary Slab Finish:

Ordinary slab finish applies to floor surfaces which are intended to receive tiles and other floor coverings or without any coverings, as indicated. When the concrete surface has stiffened sufficiently, floating shall be performed by use of hand or power driven equipment, and shall be minimum necessary to produce a surface that is free from screed marks and is uniform in texture. Floating shall be continued until a small amount of mortar without excess water is brought to the surface so as to permit effective trowelling. Steel trowelling shall be started when the floated surface has hardened sufficiently to prevent excess of fine material from being drawn to the surface. Steel trowelling shall be performed with firm pressure such as will flatten the sandy texture of the floated surface and produce a dense uniform surface, free from blemishes and trowel marks. Surface irregularities measured as described in sub Clause 5.15.1 general, shall not exceed 3/8".

5.15.5 Fair Finish:

Fair finish (FF) applies to the exposed formed surfaces, the appearance of which is considered of special importance such as waffle slabs, Tee beams and other places shown on the drawings and the finish Schedule. Fair face means no touch afterwards.

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5.16 CURING CONCRETE:**5.16.1 General:**

All concrete shall be cured by an approved method or combination of methods in accordance with ACI 308 than 71 and in this section, "Recommended Practice for Curing Concrete". The Contractor shall have all equipment and materials needed for adequate curing and protection of the concrete on hand and ready to use before actual concrete placement begins. Means shall be provided for the protection of concrete from the sun, drying winds, and traffic until the specified curing has been completed. The curing medium and method, or the combination of mediums and methods used, shall be subject to approval in writing. The curing mediums shall be applied so as to prevent loss of moisture from the concrete. Concrete shall be protected from heavy rains for 24 hours and direct rays of the sun for 14 days. All concrete shall be adequately protected from damage. No fire or excessive heat, including the heat resulting from the welding of any sort or reinforcing bars etc., shall be permitted near or in direct contact with concrete at any time. All galleries, conduits and other formed openings through the concrete shall be closed during the entire curing period.

5.16.2 Moist Curing:

Unless otherwise approved, the concrete shall be moist-cured by maintaining all surfaces continuously (not periodically) wet for at least 14 days immediately following the placing or until covered with fresh concrete. Curing water shall be removed without allowing stagnant pools of water to form on the exposed lift surface. Water for curing shall comply with the applicable requirements of Clause 5.6 Surfaces of concrete, which are to be permanently exposed, shall be cleaned if a water is used which stains the surfaces during curing. Where forms of tongue-and-groove or ship-lap sheeting are used and are left in place during curing, the sheathing shall be kept, at all times when in contact with mass concrete, steel forms shall be kept wet. Horizontal construction joints and finished horizontal surfaces cured with sand which shall be covered with a minimum uniform thickness of 50 mm (2 inch) of sand which shall be kept continuously saturated. The following exceptions to the requirements for moist curing are permitted:

- i) Horizontal construction joints may be allowed to dry for six hour immediately prior to placing of the following lift:
- ii) Moist curing of surfaces, against which back-fill is to be placed within 24 hours of concrete placement, will not be required:

5.17 PLACING REINFORCEMENT:**5.17.1 Supports:**

Reinforcement, pre-stressing steel and ducts, shall be accurately placed and adequately supported before concrete is placed, and shall be secured against displacement within permitted tolerances. Welding of crossing bars shall not be permitted for assembly of reinforcement unless authorized.

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5.17.2 Tolerances:

Unless otherwise specified, reinforcement, prestressing steel, and posttensioning steel ducts shall be placed within the following tolerances:

For concrete protection and for depth, d in flexural members, walls and compression members where d is:

8" or less	+	1/4"
More than 8" but less than 24"	+	3/8"
24" or more	+	1/2"

but the cover shall not be reduced by more than one-third of specified cover.

For longitudinal location of bends and ends of bars: + 2" except at discontinuous ends of members where tolerance shall be + 1/2".

5.17.3 Draped Fabric:

When welded wire fabric with wire of 1/4" diameter or less is used for slab reinforcement in slabs not exceeding 10' in span, the reinforcement may be curved from a point near the top of the slab over the support to a point near the bottom of the slab at midspan, provided such reinforcement is either continuous over, or securely anchored at, the support.

5.18 MEASUREMENT:

For any item of work constructed under this section, measurement shall be made by volume. The unit of measurement shall be made on cu. ft/m. In computing the concrete quantity the dimensions used shall be the plan dimensions of the concrete with the neat lines shown on the plans except that no deduction will be made for weep holes and floor drains and no account shall be taken of chamfers, scorings, and fillets of 4 cm radius or less in cross section area.

The quantity to be paid for shall be the original plan quantity, measured as provided above, except that where the plans call for an estimated quantity of miscellaneous concrete for contingent use such contingent concrete shall be measured as the actual quantity by the in-place and accepted.

No measurements for or other allowances will be made for work or material for form, false work, pumping, bracing, etc. the volume of all material embedded in the concrete such as structural steel, pile heads, etc. except reinforcing steel, shall be deducted in computing the volume of concrete to be paid for.

5.19 RATE & PAYMENT:

The unit rate for various types of Portland Cement Concrete shall be full compensation for all the work specified. Payment for Portland Cement Concrete shall be made at the unit rates in the priced Bill of Quantities. Reinforcement will be paid for as applicable in Section of "Reinforcement".

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6.1 DESCRIPTION:

The work to be done under this Section shall include furnish, cut, bend, and place all steel reinforcement as indicated on the Drawings or otherwise required. All reinforcement when surrounding concrete is placed shall be free from loose, flaky rust, and scale, and free from oil grease or other coating which might destroy or reduce its bond with the concrete. All placing shall be in accordance with Drawings furnished or approved. The use of reinforcement for the transmission of current for welding will not be permitted. All reinforcement, including dowels, remaining exposed in the work shall be suitably protected until embedded in concrete.

6.2 CUTTING AND BENDING:

Steel reinforcement may be mill or field cut and bent. All bending shall be in accordance with standard approved practice and by approved machine methods. When bending is required, it shall be performed prior to embedding the bars in the concrete. In all such cases, the bars shall be cold bend. Bending or straightening of bars partially embedded in set concrete shall not be permitted except in isolated cases where corrective action or a field change is required and is so specifically approved.

Reinforcement shall not be bent or straightened in a manner that will injure the material. Special care shall be taken to ensure accurate bending of reinforcement for small and thin members, particularly in respect of binders.

Bending hot at a cheery-red heat (not exceeding 840 degree centigrade) will be allowed for mild steel bars. Bars bent hot should not be cooled by quenching.

6.3 QUALITY:

Concrete reinforcement bars shall be of following quality:-

- a) Cold work steel bars for concrete reinforcement shall conform to BS 4461:1969 embedded to date.
- b) Deformed steel bars for concrete Reinforcement shall be Grade 60/40 conforming to ASTM 615-80.

The Contractor shall provide labour, materials; arrange fabrication and fixing measuring and testing facilities to ascertain quality, weight or quantity of steel at his own expense. No steel shall be incorporated in the work without prior approval.

6.4 PLACING AND POSITIONING:

Reinforcement shall be placed and maintained within the specified tolerance of its position shown on the drawings. Where practicable, it is recommended that the reinforcement be performed into rigid cages, spot wilding being permissible for this purpose.

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Where tying wires or clips are used, care should be taken to ensure that the projecting ends do not encroach into the concrete cover. Strict and constant vigilance must be exercised to ensure that the reinforcement is maintained in its correct position at all stages and for all methods of placing and compacting the concrete. Normally, spacing blocks used for this purpose shall be made of mortar comparable in strength and durability with the main concrete.

Other kinds of spacers shall be of a proved and agreed type, suitable for the conditions to which the unit will be exposed.

6.5 RELATION BARS TO CONSTRUCTION SURFACES:

The cover of all main reinforcement shall be as specified or shown on the Drawings. The dimensions, as shown on the drawings, indicate the clear distance from the edge of the main reinforcement to the concrete surface. The concrete covering of stirrups, spacer bars, and similar secondary reinforcement may be reduced by the diameter of such bars. The actual concrete cover to all steel at any point shall not be less than the required nominal cover by more than 1/8".

The effective depth of fully or nearly fully stressed tensile-reinforcement shall not be less than that given on the Drawings by an amount exceeding 5 percent of the effective depth of the section being considered or 1/4" whichever is the greater.

6.6 SPLICING:

Except as otherwise shown on the Drawings or specified herein, all splices, lengths of laps, splice locations, placement and embedment of reinforcement shall conform to the applicable requirements of American Concrete Institute 318-89 or 95, Building Code Requirements for Reinforced Concrete. All splices and locations of laps in reinforcement shall be as shown on the Drawings or as directed. Additional bar splices shall be provided as required, subject to approval. Lapped ends of bars may be placed in contact and securely wired or may be separated sufficiently to permit the embedment of the entire surface of each bar in concrete. If welded splices are proposed, welder of approved qualification and experience shall be employed after obtaining proper approval. Sufficient number of welds shall be tested to failure in each lot to maintain a check on the quality at the cost of the Contractor.

All reinforcement shall be secured in place by use of metal or concrete supports, spacers, or ties, as approved. Such supports shall be of sufficient strength to maintain the reinforcement in place throughout the concreting operation. The supports shall be used in such a manner that they will not be exposed or contribute in any way to the discoloration or deterioration of the concrete. Concrete supports shall be manufactured of the same concrete mix as used in the structure to be concreted.

6.7 TOLERANCES:

Following tolerances shall be observed:

SECTION - 6: STEEL REINFORCEMENT

6.7.1 Bars used for concrete reinforcement shall meet the following requirements for fabricating tolerances:

- a) Sheared length : +1 in.
- b) Depth of truss bars : +0 - 1/2 in.
- c) Overall dimensions of stirrups, ties, and spirals : + 1/4 in.
- d) All other bends + 1 in.

6.7.2 Bars shall be placed to the following tolerances:

- a) Clear distance to formed surface : + 1/4 in.
- b) Minimum spacing between bars : 1.4 in.
- c) Top bars in slabs and beams:
 - i) Members 8 in. deep or less : + 1/4 in.
 - ii) Members more than 8 in.
but not over 2 feet deep : + 1/2 in.
- d) Crosswise of Members : Spaced evenly within 2 in.
- e) Lengthwise of Members : + 2 in.

6.7.3 Bars may be moved as necessary to avoid interference with other reinforcing steel, conduits or embedded items. If bars are moved more than one bar diameter, or enough to exceed the above tolerances, the resulting arrangement of bars shall be subject to approval.

6.8 EMBEDEMENT ITEMS:

Before placing concrete, care shall be taken to determine that all embedded items are properly placed as required under the Specifications and are firmly and securely fastened in place as indicated on the Drawings, or as required. Embedded items shall be free of oil and other foreign matter such as loose coatings of rust, paint, and scale. The embedding of wood or other foreign materials in concrete is prohibited.

6.9 MEASUREMENT:

Measurement will be made of the number of tons of reinforcing steel acceptably placed on the basis of the lengths of bars installed in accordance with the approved Drawings or bars schedules or as directed, converted to weights for the size of bars lists by the use of actual weights or unit weights per linear feet as follows:

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Bar Designation

- Nominal Unit Weight
Lbs. Per Foot.

# 3	0.376
# 4	0.668
# 5	1.043
# 6	1.502
# 7	2.044
# 8	2.670
# 9	3.400
# 10	4.303
# 11	5.313
# 14	7.650
# 18	13.800

- Unless otherwise specifically stated in the Bill of Quantities or herein, all items of reinforcement shall be deemed to be inclusive of, but not limited to the following:-
- Reinforcement bar bending schedule to be provided by the Contractor for approval.
- Providing materials, attendance and costs for all sampling and testing.
- Cost of M.S. binding wire and concrete, metal or plastic chairs and spacers or hangers.
- Cleaning, cutting and bending, placing and fixing in position including binding with wire and other material and placing supports and spacers.
- All sorts of transportation involved in the process.
- All reinforcement shall be provided in lengths shown in drawings and as per Specifications. Should the CONTRACTOR provide lengths of reinforcement which are greater than shown on the drawings no payment for extra lengths shall be made.

6.10 RATE AND PAYMENT:

The Contractor shall be paid for reinforcement by weight computed in accordance with Clause 6.9 from linear measurements of reinforcement actually used at Site as per drawings. No payment shall be made for steel chairs or wastage.

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7.1 DESCRIPTION

The Damp Proof Course shall be horizontal and vertical as shown on the drawings and specified in the Bill of Quantities.

7.2 HORIZONTAL:

The horizontal D.P.C. shall consist of 1-1/2" thick, (1:2:4) cement concrete with a layer of polythene sheet and two (2) coats of S.I.B. (Specified Industrial Bitumen) grade 10/20.

7.3 VERTICAL:

The vertical D.P.C. shall consist of 3/4" thick 1"4 cement sand mortar and two (2) coats of hot S.I.B.

7.4 MATERIAL REQUIREMENTS:

All materials i.e. cement, sand aggregate, water polythene sheet and bitumen t shall conform to the specifications given in respective section.

7.5 CONSTRUCTION REQUIREMENTS:

The Contractor shall lay the D.P.C. only when the level, quality of masonry work, etc. is approved.

The concrete work of D.P.C. shall conform to the relevant specifications given in this section for the execution of these items.

Horizontal D.P.C. shall extend to the full width of wall i.e. upto the external faces. No portion of doors opening, etc. shall be left while laying D.P.C. the period of curing of concrete shall be not less than 72 hours. Every care should be taken that concrete is not left dry during this period. The work of laying Damp Proof Course shall be carried out as follows unless otherwise described in BOQ:-

- a) Placing 1-1/2" thick layer of 1:2:4 cement concrete.
- b) Laying 2 coats of hot bitumen S.I.B. grade @ 20 lbs. per % sq. ft. (each coat) over entire width and lengths of concrete after the concrete has been properly cured for at least 72 hours, and sand blinding where specified.
- c) Laying of polythene sheet 500 gauges over entire width and length of concrete after the concrete has been treated with 2 coats of hot bitumen.

The application of bitumen coating in case of vertical D.P.C. shall be same as

- c) Laying of polythene sheet 500 gauges over entire width and length of concrete after the concrete has been treated with 2 coats of hot bitumen.

The application of bitumen coating in case of vertical D.P.C. shall be same as mentioned above.

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7.6 MEASUREMENT:

The measurement shall be made in per sq. ft./M. by measuring length and breadth/height of works done and as shown on the drawings.

7.7 RATE:

The unit price for damp proofing shall be full compensation for furnishing and placing all materials and for all lab-our, equipment, tools and incidentals necessary to complete the work prescribed in this Section.

7.8 PAYMENT:

The quantities determined as provided above shall be paid for at the unit price in the Bill of Quantities.

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8.1 DESCRIPTION:

The work under this Section shall include all type of brick work in foundation, super structure; Facia drains manholes and elsewhere as shown on the drawings.

The brick work wherever referred to shall be first class brick work. Unless other wise specified the work shall be carried out in English bond or as shown on drawings.

8.2 MATERIAL REQUIREMENTS:

Unless otherwise specified or directed all materials, i.e. bricks, sand cement and water, etc. shall conform to specifications given in the Section-I "Materials".

8.2.1 Mortar:

The ratio of cement (Ordinary Portland Cement) Sand mortar to be used for brick work shall be as specified in the BOQ and as per drawings.

8.2.2 Preparation of Mortar:

Cement and sand shall be thoroughly mixed in dry state on a pacca platform or on metallic sheets or trough Water shall be added in a manner so that segregation of cement does not take place. Mixing of mortar shall produce a homogenous workable mass.

Precautions:

- a) Only such quantity of mortar shall be prepared as can be used before the initial setting time of cement.
- b) Any mortar which has initially set shall not be used.
- c) At the close of day's work the mixing troughs pans or platforms shall be thoroughly washed and cleaned.
- d) Accurately control and maintain specified proportions.

8.3 CONSTRUCTION REQUIREMENTS**8.3.1 Precautions:**

- a] Erect no masonry when the ambient temperature is 40 degree centigrade or less except by permission. Build upon no frozen work and lay no masonry having a firm of frost on their surfaces.
- b] Should cuts be required in walls for the passage of conduit etc. the entire cut out shall be filled with mortar.

8.3.2 Selection of Bricks:

The bricks shall be selected for face work before incorporating in the work. The brick for the face work in particular shall be of uniform size shape even colour and smooth

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texture. No extra payment shall be made for such selection of bricks or extra fair face work unless otherwise provided in the B.O.Q.

8.3.3 Soaking of Bricks:

Before use all bricks shall be soaked in clean water in a tank for at least two hours.

8.3.4 Bond:

Unless otherwise specified all bricks shall be laid in English bond with frogs upward.

8.3.5 Tools:

All equipment used for mixing mortar, transporting it and for laying bricks shall be clean and free from set mortar, dirt, or other injurious foreign substances. It shall be thoroughly cleaned, at the end of each day's work.

8.3.6 Progress:

Brick work shall be carried up in a uniform manner. No portion shall be raised more than 3 feet above another at the same time. Temporary spaces left during construction shall be stepped and not toothed. Straight edges supplied to brick layer shall have courses marked on them with saw cut or measuring rod shall be provided and layer of courses shall be checked all over the building from time to time so as to help all courses level.

8.3.7 Fixtures:

Hold-fasts and similar fixtures shall be built in with in surrounding brick work in their correct position in specified mortar. They shall be built in as the work progresses and not inserted later on into space left for them.

8.3.8 Laying of Bricks:

Each brick shall be set with both bed and vertical joints properly filled with mortar and thoroughly bedded. Thickness of joints shall not be less than 1/4" (6 mm) and shall not more than 1/2" (12 mm). The height of 4 courses and 3 joints as laid shall not exceed 1" (25 mm) in height of 4 bricks piled dry one upon the other.

No half bricks or bats shall be used except where necessary to complete the bends etc. At corners alternate Courses of bricks shall be laid header-wise and stretcher-wise, so as to bind the two walls together. All brick work shall be truly plumbed and each as of four brick courses shall be checked with plumbed and straight edges. The joints of brick work which is to be pointed or plastered shall be raked out to a depth of half an inch (12 mm). The raking shall be done before the mortar sets each day. All anchors, ties and reinforcing shall be placed where required. Unless otherwise specified or shown on drawings metal ties in cavity walls/brick facing shall be spaced in a staggered manner with a minimum spacing of feet horizontally and 18 inches vertically.

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8.3.9 Anchors:

Install reinforcing bars anchors projecting into the masonry a minimum of 6" and into the facing brick a minimum of 3" bars during the construction at 18" centers vertically and 36" horizontally.

8.4 BRICK WORK IN ARCHES:

All the bricks used in arches must be selected carefully. The joints of all the bricks in each course shall be laid radially and bricks shall be cut to ensure uniformity in the width of the joints.

8.4.1 Workmanship:

Arches shall be constructed true to radius on centering with 1/8" variation permitted.

The centering shall be accurately constructed of wood preferably, or metal, depending on the radius of the arch. However, if masonry centering is used, the top shall be covered with building paper to permit masonry to move as the mortar shrinks.

8.4.2 Method of Construction:

Arches shall be constructed in segments day by day as required by construction drawings. Brick work adjoining the arches shall be built level with the arch construction, so that the arch is not under load at any stage of construction.

Where arches are reinforced, the grout shall be poured in stages as each segment is built. Grout must be kept clean of loose mortar, and of mortar projections at all times.

The construction of inverted arches if required shall require special effort to ensure that the stretcher bricks are cut to a true radius in order to provide a proper bed for the arch. The following procedure may be followed:-

- a) Erect a wood frame, flush with the outer face of a wall, upon which the radius centre may be marked.
- b) Nail a radius rod to this point which has been marked as extrados and intrados of the arch with allowance for 1/2" mortar joints.
- c) As the work progresses up, the bricks intersecting the line of the extrados should be laid temporarily in position, marked and accurately cut to fit the radius.
- d) After laying about eight courses of brick in this manner the arch itself may be started using the radius rod to check the real points and the curve.

8.4.3 Cut Brick Work:

Bricks shall be cut dressed or grooved as required or shown on the drawings. No extra payment shall be made for such work.

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8.4.4 Bed Plates of Concrete:

Bed plated of cement concrete Class-C shall be provided under each beam or joints. They shall conform to the dimensions given in the drawings. The payments of bed plates will be made as per relevant BOQ item of cement concrete Class-C.

8.5 CURING:

All brick work shall be protected during construction from the effect of rain and frost or any natural forces. If the work already carried out gets damaged shall be made good by the Contractor at his own cost without any extra payment whatsoever.

8.6 SCAFFOLDING:

Necessary and suitable scaffolding shall be provided to facilitate Construction of brick wall in superstructure. Scaffolding shall be sound and strong with supports and member sufficiently strong so as to withstand all loads likely to come upon them.

8.7 MEASUREMENT:

Measurement for payment for brick work will be made to the neat lines of the structures as shown on the Drawings or as modified for the appropriate items for which such brick work is incorporated. Deductions will be made for all openings for doors, windows, ventilators, gates etc.

8.8 RATE AND PAYMENT:

Payment for brick work will be made at the unit rate per Cu. Ft./M. or as tendered in the Bill of Quantities. The unit rates tendered for such work shall include the cost the cost of brick, mortar and all operations of operations, placing, curing, etc. where necessary, and of all other operations, procedures and requirements necessary to complete the brick work in accordance with this specifications. Rate shall also include anchors, ties reinforcing wherever used.

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9.1 DESCRIPTION:

The work under these sections of making terrazzo floor in conformity with British Standard Code of Practice CP 204. In situ flooring Part-1, "General" and Part-3, "Terrazzo Flooring" as applicable to the work shown on the drawings and specified in the Bill of Quantities.

9.2 MATERIAL REQUIREMENTS:

Cement, Sand, Aggregate for concrete and Water shall conform to relevant specifications.

9.2.1 Marble Chips: Shall be crushed marble, and shall be best quality white or coloured, having an abrasive hardness of not less than 16 and the size shall vary from No. 4 to 8 or as specified.

9.2.2 Dividing Strips: Shall be marble strips of 12 mm x 1 1/2" or glass strips 5mm thick and 1-1/2" (38mm) wide or as specified in Bill of Quantities.

9.2.3 Marble powder of clean approved quality.

9.3 SAMPLES:

All materials used for Terrazzo work as well as samples for terrazzo floor shall be approved and the same type of material will be used throughout the work. If the material is to be tested, the Contractor will do so at his own cost from laboratory approved by the Engineer.

9.4 CONSTRUCTION REQUIREMENTS IN SITU TERRAZZO FLOORING:

The floor shall consist of a wearing surface of consistency and net thickness as specified in Bill of Quantities, laid over 1:2:4 concrete base of the specified thickness. The net thickness specified for wearing surface shall be that obtained after grinding and polishing, 1:2:4 concrete shall be mixed and laid in the manner specified for cement concrete floor, using a minimum quantity of water for workability.

The cement concrete shall be leveled with a trowel and straight edge, consolidated and finished with steel trowels to an even but rough surface. The top layer of cement marble chips mixed in the proportion of 1:2 (1 cement mixed with 10% marble powder and 2 marble chips) shall be laid over it within 24 hours. The cement and marble chips must be mixed dry in such quantities as are sufficient for a unit of one specified shade. Water shall be added to only such quantities as can be mixed thoroughly and consumed in less than 30 minutes, the quantity of water being the minimum for workability. Mixing must be done on water tight platform and any mix not used within 30 minutes shall be discarded and removed from site. A layer of cement and marble chipping mixture should be well troweled into the surface of the base concrete before filling to the top level of the screeds. The layer should be well compacted and all voids shall be filled in. A layer of

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neat cement of the specified colour shall then be well trowelled into the surface leaving a plain smooth surface.

Floors shall be laid in panels of about 4.0'x4'-0 (1.2x1.2 meter) or of size as shown on the drawings. Dividing strips of glass/marble as specified shall be provided and fixed to exact levels making an allowance for grinding. Aluminum strips shall not be less than 3mm thick and of width equal to the total thickness of cement concrete base and Terrazzo Topping.

Three days after laying the top layer must be evenly and smoothly machine ground with carborandum blocks of coarse, medium and fine grades so as to ensure that all marble chippings are evenly exposed all over the surface. If marble chips are not evenly exposed the Contractor shall pull down the surface and re-lay it at his own cost. After the first grinding, the floor shall be thoroughly grouted with the same cement and colour composition as specified for the terrazzo mix. The grout shall be of the consistency of thick cream and shall be brushed over the floor to eliminate all impressions and thoroughly fill the surface for final grinding. The surface after grinding shall be left undisturbed and cured for 2 or 3 weeks, after which it shall be cleaned of dirt and dust by rubbing gently with pumice stone or washing soda in sufficient water. Three days after the surface has been cleaned it shall be rubbed hard with 1:10 solution of oxalic acid using felt. The surface shall then be cleaned and washed with plenty of water. After the surface has dried a final gloss shall be given by polishing the surface. The walls and all surfaces of the finished works of other trades shall be properly protected from damage and spoiling during the process of grinding and washing of the terrazzo. After the finish grinding has been completed and the surface treatment applied, the terrazzo work shall be covered and protected with approved material until completion of the work of all other trades.

9.5. TERRAZZO DADO AND SKIRTING:

The marble chips and cement shall conform to specification for floor. Missing shall be done in the same manner and proportion. The plastered surface over which the dado/skirting is to be applied shall be well roughened and watered; cement mortar of specified ratio shall then be plastered over this well roughened surface to indicated thickness. Before the base course has set the layer of terrazzo mixture shall be well trowelled into the surface of the base to a thickness which after grinding shall result in the finished thickness as per Bill of Quantities. A layer of neat cement of the specified colour shall then be well trowelled into the surface leaving a plain smooth surface. After the period specified for floors above, the Contractor shall start finishing as for floors specified above. Terrazzo skirting shall be provided around all terrazzo floors unless shown otherwise. Skirting and dado shall be straight, level and in plumb. Intersections at floors shall be straight and flush.

9.6. TERRAZZO ON STAIRS:

The stair risers and treads shall be finished according to exact sizes including the terrazzo topping making allowance for grinding of terrazzo. The nosing shall be flush

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with the terrazzo toppings, and shall be protected by aluminum angles as specified or shown on Drawings. The angles shall be firmly secured, secured, by means of counter-sunk brass screws and cast together with the step.

9.7 PRECAST TERRAZZO TILES:

9.7.1 The pre-cast terrazzo tiles shall be machine compressed tiles made of Class-C concrete (3000 psi) using aggregate of fine size with terrazzo finish of the pattern, shade and thickness as specified in the Bill of Quantities, drawings or as directed by the Engineer. The size of tiles shall be as specified or approved by the Engineer.

9.7.2 The tiles shall be manufactured under special order by approved, manufactured of terrazzo tiles. The Contractor shall produce four samples of each type of terrazzo tiles, out of which two will be returned to him after approval for reference and comparison at the time of mass production and lying in position.

9.7.3 The first two grinding of the terrazzo tiles shall be done in the factory by machines and the final grinding and polishing shall be carried out after laying position.

9.7.4 The laying and fixing of terrazzo tiles shall be carried out in accordance with working drawing and the joints shall be arranged as directed By the Engineer. The mix and thickness of embedding layer of mortar will be as specified in the Bill of Quantities of directed by the Engineer.

9.7.5 It shall be the responsibilities of the Contractor to provide and fix protection devices against weather or damage and staining during the completion process. On the completion of the building operation the Contractor shall thoroughly clean down the completed tile work and attend to any defect in the surface, joints or polishing before handing over to the Owner.

9.8 MEASUREMENT:

Work for floor and dado shall be measured in Sq. Ft/M of wall and floor area, skirting shall be measured in Lin. Ft /M.

9.9 RATE AND PAYMENT:

The rate of all times of work under this section shall cover the cost of furnishing all materials, labour, scaffolding framework lying, curing, grinding, polishing, finishing and appliances at site and performing all operations at any height in accordance with drawings, Bill of Qualities and as specified. The rate shall include the cost of furnishing and installing metal fixings, dividing strips for floors, dados, nosing, angles aluminum J-channels and screws for stairs etc., and providing all assistance to other trades for built in items to satisfaction of the Engineer.

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SECTION - 9: TERRAZZO FLOORING

PAY ITEM NO.	DESCRIPTION	UNIT
9.9 (A)	Terrazzo floor of specified thickness in (1:2) cement/chips 13mm topping over PCC with. <u>Glass Strip</u> <ul style="list-style-type: none"> In white Cement In Grey Cement In 50% White, 50% Grey Cement <u>Marble Strip 75 mm Wide</u> <ul style="list-style-type: none"> In White Cement In Grey Cement In 50% White, 50% Grey Cement 	Sq.Ft/m. Sq.Ft/m. Sq.Ft/m. Sq.Ft/m. Sq.Ft/m. Sq.Ft/m.
9.9 (B)	Terrazzo skirting of specified thickness with groove and PVC strip <ul style="list-style-type: none"> In White Cement In Grey Cement In 50% White, 50% Grey Cement 	Sq.Ft/m.
9.9 (C)	Terrazzo Dado of specified height and thickness <ul style="list-style-type: none"> In White Cement In Grey Cement In 50% White, 50% Grey Cement 	Sq.Ft/m.
9.9 (D)	Precast terrazzo tiles 12" x 12" 1-1/8" or as specified thick with 3/8" terrazzo topping (1:2) pigmented including 3/4" thick 1:2 P.C.C. base.	

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SECTION – 10: SUSPENDED CEILING & ACOUSTIC TREATMENTS

10.1 DESCRIPTION:

Providing and fixing in position suspended ceiling in area as shown on drawing and Treatment on walls.

The types of suspended ceiling are:

- a. Mineral Fiber Acoustic Tiles Fire Fissured
- b. Mineral Fiber Acoustic Tiles Vivid Face and co-ordinate – 41
- c. Medium Density Fiber (MDF) Ceiling Panels
- d. Commercial ply with Fabric on curved framing
- e. Plaster lath finish with plastic emulsion Paint Finish, on ceiling and walls

Providing and insulation of:

- i) Glass fiber wool Acoustic insulation applied on walls.
- ii) Rigid Straw board Acoustic panel applied on walls.

10.2 MATERIAL REQUIREMENTS:

— The materials shall be of approved manufacturers and shall be according to manufacturer's specification. The acceptable manufacturers are:-

- Diakin Trade Industry Co. Ltd. Japan, Local Agens
- Azeem Associates, Matha Lodge, Abdualah Haroon Road, Karachi
- Opp. Carvan Hotel, Mcload Road, Lahore.

Plaster Lath Finish as per Specification given here-in-after.

10.3 CONSTRUCTION REQUIREMENTS:

a) Mineral Fiber Acoustic Tiles

The Acoustical material shall be non-combustible mineral Fiber (Select Tone) concealed tile, as per manufacturers specifications.

The Acoustical Material shall be manufactured by wet-felting process with factory applied washable white paint finish having a light reflectance of 75% or more.

b) For Mineral Fiber Panels

These shall be Hard (wet felt) Mineral Fiber Ceiling tiles or planks manufactured from a combination of the following naturally occurring, processed and recycled

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SECTION - 10: SUSPENDED CEILING & ACOUSTIC TREATMENTS

materials in varying proportions depending upon the tile type: mineral wool, clay, perlite, cellulose and starch mixed together in a water based process before being cured by heat.

They shall be then finished with a water based paint, or laminated scrim and paint, decorative facing. Wet felt technology allows considerable variation in the product's density and porosity which can be used to positively influence a wide range of technical performances of the finished products.

c) MDF Ceiling Panels

Medium Density Fiberboard has a fine texture that is even throughout its length. This is due to the method used in manufacture. It is formed by the bonding of fine wooden fibers together under high pressure.

The ceiling panels shall be of approved thickness specified and shall be fixed in position with the provision of light fixing arrangements. It shall be finished with Lacquer polish of approved color and shade as per drawing, specifications and as directed.

d) Fabric

This is a Flame Retardant Tailored wool's used for covering of walls and ceilings. The walls should be clean and primed before application. A thin coating of vinyl adhesive to the wall surface not the fabric shall be applied. Allow adhesive to become tacky. Then apply material to wall. Make sure that the edges but evenly. Then roll the Fabric firmly.

e) Plaster Metal Lath

Metal Lath shall be fixed to the ceiling frame or to the wall as shown on the drawing. Cement sand plaster of ratio and thickness specified on drawing and BOQ shall be applied and painted with prime coat and two coats of approved plastic emulsion paint.

10.4 SUSPENSION SYSTEM:

a) For Fiber Acoustic Tiles

Aluminum T-bars, cross- bars CKM or Equivalent and hold down chips; complete as per drawing.

b) For Mineral Fiber Panels

The mineral Fiber False Ceiling shall be demountable type of approved design, quality and Suspension system with imported section. They shall be of approved standard grid.

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SECTION – 10: SUSPENDED CEILING & ACOUSTIC TREATMENTS

c) For MDF Ceiling Panels

The panels shall be installed and fixed in position with an approved suspension system including 1" wide aluminum strip in both directions as per drawings.

d) For Fabric Over Ply

3mm thick commercial ply shall be fixed to the curved framing and over the ply. Fabric shall be applied as specified.

e) Metal Lath Plaster

Steel framing of angle iron, tees etc. shall be as shown on the drawing. Diamond metal lath shall be fixed to the framing by means of wire ties. Cement sand plaster of ratio and thickness shall be applied to the mesh and surface of plaster painted with Prime Coat and two coats of plastic emulsion paint.

10.5 GENERAL REQUIREMENTS OF CEILING INSTALLATION:

Space of received ceiling units shall be satisfactorily closed and protected against the weather before beginning work.

- Maintain temperature of 10 degree centigrade or above while system is being installed.
- Space of receive ceiling units shall be dry and with no more dampening materials to be installed.
- Application of ceiling units shall be done in strict accordance with the manufacturer's specifications unless otherwise modified.
- Install ceiling units in a true and even plane, in straight line, courses laid out symmetrically about centre lines of ceiling or panel.
- Reinforcement shall be provided around openings of electrical lighting, air diffusers and access panels as indicated and shown on drawings.
- Reinforcement bracing for hanger bolts shall be provided where the height of space in ceiling is more than 1.5 meter.
- Anti- corrosive paint shall be provided at welding points.
- Access panels shall be furnished and installed as shown on drawings in strict accordance with manufacturer's specifications.

10.6 SHOP DRAWINGS:

The Contractor shall prepare shop drawings on the basis of drawings produced by the Consultants for all the suspended ceiling works to be carried out on the project. These drawings shall show clearly the sizes, methods of fixing, jointing and the anchorages to

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SECTION - 10: SUSPENDED CEILING & ACOUSTIC TREATMENTS

be used in the process and the Contractor shall get approval in writing from the Engineer well in time, before the actual start of the work.

10.7 PAINTING:

All suspension work made of Steel or Iron shall be painted with prime coat and two coats of approved enamel paint.

10.8 MEASUREMENT:

The work under the section shall be measured and paid by the superficial area on which work has been satisfactory carried out and approved. The unit of measurement shall be Sq. Ft/m.

10.9 RATE AND PAYMENT:

The units rate shall include the cost of furnishing all the materials, labour, scaffolding, appliances, tools and performing all operations in accordance with the specifications, drawings and instructions of the Engineer for satisfactory completion and finishing of the work. No extra payment shall be made for making provisions, for suspension systems and frames for light fittings and fixtures, ducts, diffusers adhesive etc., protection and maintenance of work as specified and the rate shall be deemed to be inclusive of all such costs and charges. No extra payment shall be paid for the maintenance material as specified.

PAY ITEM NO	DESCRIPTION	UNIT
10.9 (a)	Mineral Fiber Acoustic Tiles (Fiber Fissured) ceiling including Suspension System	Sq. Ft/m
10.9 (b)	Mineral Fiber Acoustic Tiles (Vivid Face) ceiling including Suspension System	Sq. Ft/m
10.9 (c)	Mineral Fiber Acoustic Tiles (Co-ordinate-41) ceiling including Suspension System	Sq. Ft/m
10.9 (d)	Medium Density Fiberboard (MDF) including Suspension System	Sq. Ft/m
10.9 (e)	Suspended ceiling with Fabric over ply including Suspension System	Sq. Ft/m
10.9 (f)	Fabric paneling on wall	Sq. Ft/m
10.9 (g)	Metal Lath Plaster ceiling including Suspension System	Sq. Ft/m
10.9 (h)	Metal Lath Plaster over walls	Sq. Ft/m

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11.1 DESCRIPTION:

The work covered under this Section of specifications consists of furnishing all labour materials and equipments and performing all operation with the carrying out of the work of P.C.C. flooring, including all related items such as wearing surfaces, bases skirting etc., in strict accordance with the requirements of Drawings and schedule of floor finish and subject to the terms and conditions of the Contract Documents.

11.2 GENERAL:

The Contractor shall follow and adhere to written instructions as mentioned on drawings and specification. Floor finishes shall be laid true to the line and level. Any work covered under this section of the specifications, not conforming to the requirements of the specified quality and workmanship will be rejected and the Contractor shall be required to remove and replace such work as directed at his own cost.

11.3 MATERIAL REQUIREMENTS:

11.3.1 Cement sand coarse aggregate shall conform to the specification given in Section-1 "Material".

11.3.2 Division Strips:

Division strips shall be 1-1/2" deep x 5mm thick plate glass or as specified embedded and fixed with cement mortar in base concrete to a required depth, level, plumb, line, angle, panel, shape to meet the requirements.

11.3.3 Base:

The base shall be both dry brick ballast and sand or lean concrete Class-E or as specified in BOQ item and as shown on the drawings.

11.4 CONSTRUCTION REQUIREMENTS:**11.4.1 Preparation of Base:****Floor:**

The surface of the base concrete shall be brushed with a stiff broom just before it hardens to remove all laitance and loose aggregate and at the same time to roughen the surface to improve the bond. The hardened base shall be thoroughly cleaned, wetted preferably over night, the surplus water removed and a grout of cement and water brushed into the surface just ahead of the application of the topping.

Dado/Skirting:

The plaster on the portion of the wall to be provided with skirting or dado shall be left in a rough state by brooming or by using wire-brushes of approved type so as to provide a bond between this base plaster and the dado or skirting. The surface of the wall shall be

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cleaned of all foreign matter and shall be thoroughly wetted to control the suction. Only so much mix shall be mixed with water that could be utilized within 30 minutes. This mix of cement sand shall be applied to the wall and trowelled hard to a smooth surface, proper in line both vertical and horizontal. Finishing for the cement sand skirting shall conform to specifications for plaster work "Section 16".

11.4.2 Panels:

Before laying the cement concrete flooring, the surface of the base shall be divided into panels of required sizes as shown on drawings. Panels shall be made of glass screeds or as specified. The top of the screed shall conform to the specified level of the finished floor surface.

11.4.3 Mixing and Placing:

Mixing and placing of concrete shall be in accordance with specification given under heading "Concrete Work".

Concrete may be conveyed in any suitable manner from the place of mixing provided there is no segregation or loss of any ingredients; and provided it is placed in its final position before initial takes place, that is within 30 minutes of addition of water to the mix. The concrete will be laid in a manner so as not to cause the aggregate to separate from the mortar. The concrete shall be rammed and thoroughly consolidated until the mortar creams up to the surface.

The concrete will be laid in alternate panels, each panel not exceeding the area, as directed. Dividing Strips of glass as specified shall be provided wherever shown on drawings.

11.5 FINISHING:

Immediately after consolidation, the surface shall be leveled with a wooden trowel. Excessive trowel ling in the early stage shall be avoided. The surface shall be tested with a straight edge to detect undulations, which, if found, shall be eliminated. The finer stuff in the concrete which has come to the surface with the concrete has hardened sufficiently; trowel ling shall be done with steel trowel. No dry cement or a mixture of dry cement with sand shall be sprinkled on the surface for hardening the surface.

a) Concrete Floor (Smooth) with Topping:

Colour topping shall consist of a pigment which shall be added to cement on trial basis till the required shade is obtained. Thickness of the colour topping shall be 1/8" thick.

An approved sample specimen of the topping of required shade shall be available at the site before proceeding with the entire work.

After approval of the trial specimen adequate quantity of the mixture of pigment and cement shall be prepared for sufficient work to avoid any variation in shade.

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SECTION – 11: CEMENT CONCRETE FLOORING

After wooden trowel ling of the bade, topping shall be applied to the specified thickness and spread out evenly by a wooden float, after waiting for a few minutes to bring it to a little drier stage, steel trowel ling shall be applied with pressure till a smooth finish in achieved.

b] **Concrete Floor (Roughened)**

After the floor surface has been leveled with a wooden trowel, and the concrete has hardened sufficiently it shall be roughened with expanded metal mesh, wire brush or a broom. A sheet of expanded metal mesh shall be pressed evenly on the concrete surface to achieve the required pattern. Rough surface using wire brush or broom shall be achieved by stroking the green concrete surface with smooth and even strokes as per the required pattern.

11.6 CURING:

Curing shall be done as per specifications given under section "Portland Cement Concrete".

11.7 MEASUREMENT:

The measurement for Cement Concrete floor shall be made in Sq. M/Sq. Ft. of the actual surfaces completed and approved. Cement sand skirting shall be measured in Lin. Ft/M. or as stated in the Bill of Quantities.

11.8 RATE AND PAYMENT:

The payment for floor shall be made at the unit rate per Sq. M/Sq. Ft. and for cement sand skirting it shall be made at the unit rate per Lin. Ft/M. or as stated in the Bill of Quantities and shall constitute full compensation for all materials, and equipment, labour including all incidentals necessary to complete the work. No separate payment shall be made for division strips or for the colour topping or required finish.

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SECTION - 12: ALUMINIUM DOORS & WINDOWS FRAMES

12.1 DESCRIPTION:

This work shall consist of Aluminum sections, constructed in reasonably / close conformity with dimensions and standards details below and as shown on drawings/manufactures specification.

12.2 MATERIAL REQUIREMENTS:

12.2.1 DOORS:

Section	:	Heavy Extruded Deluxe Section.
Glaze	:	Fully glazed.
Wall Thickness	:	Wall thickness should be 2.0 mm and
Anodization	:	anodization 15-20 microns.
Powder Coating	:	80-120 microns (JOTAN/OXYPLAST Coating)
Push / Pull Plates	:	100 mm aluminum patterned push / pull plates on both sides of leaves.
Hinges/Rollers	:	Stainless Steel.
Tower Bolts and Weather Strip	:	PVC weather strip should be should approved best quality placed between frame wall and edge trimming.
Glazing / Beading glassor	:	Tinted glass, plain sheet glass, tempered glass wired glassor thickness indicated on the drawing and BOQ and shall be manufactured by Sind Glass Industries Ltd. or approved equivalent, vinyl / neoprene glazing to bead.

12.2.2 WINDOWS:

	:	Heavy extruded Deluxe Section.
Water Drain System	:	Slit be provided in the section as per satanherded practice for Water drainage.
Wall thickness & Anodization / Power Coating good	:	Minimum wall thickness 2mm and 15-20. microns or Power Coated 80 to 120 Microns as specified. polyester super durable 25 years Guarantee and very outdoor durability.
Screen	:	Sliding rust proof aluminum insect screen. {Opal USA}
Lath	:	Lath for inside locking. (Mico Taiwan)
Rollers	:	Imported rollers with nylon tyres. (Matax Japan)
PVC Weather Strip	:	Between frame, walls and edge trimming.
Glazing / beading	:	Same as above
Water Proofing	:	Siliconing with silicon hairs for water proofing

Approved manufactures/suppliers: ALCOP, PAKISTAN CABLE, OR LUCKY.

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SECTION - 12: ALUMINIUM DOORS & WINDOWS FRAMES

12.3 CONSTRUCTION REQUIREMENTS:

This fixing of aluminum doors and windows, to concrete/masonry openings shall be carried out in approved methods indicated in the drawings or as directed by the Engineer in charge. Provision of necessary groove or rebate and hold fasts in the concrete shall be made in the formwork and no holding or drilling shall be allowed in the exposed concrete finishes. These shall be, executed in position after the building structure is completed and by using proper hold fasts as shown on drawing or counter sunk bolts and screws as per site requirements.

12.4 MEASUREMENT:

Payment for doors and window will be made by measuring clear opening area in brick/block work or concrete in square meter/ft.

12.5 RATE AND PAYMENT:

Rates for items under this section shall cover the cost of furnishing all the materials, labors, scaffolding all material, labors, scaffolding and appliances at site and performing all operations in connection with their installation in accordance with instructions of Engineer, including the cost of glazing, beading, friction bar stay complete as per drawing.

It is particularly mentioned that the rates for fixing doors and windows etc. shall include iron mongery fitting such as handles, push plates, stainless steel hinges and towers bots as specified and indicated on the drawings including cost of fixing and supplying glass.

<u>PAY ITEM NO</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
	Aluminum Doors and Windows	
2.5 (a)	Openable	Sq. M/Ft
2.5 (b)	Sliding	Sq. M/Ft
2.5 (c)	Fixed	Sq. M/Ft
2.5 (d)	Fixed and Open able	Sq. M/Ft
2.5 (e)	Fixed and Sliding	Sq. M/Ft

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13.1 DESCRIPTION:

The work covered under this section comprised of providing and laying best quality local made glazed/matt ceramic tiles of approved size and pattern wherever required or shown on the drawings or mentioned in the Bill of Quantities.

13.2 MATERIAL REQUIREMENTS:

Except as otherwise specified the following British Standards and Code of Practice shall be applicable to materials and fixing methods for ceramic tile work:-

- a] British Standard 1281: 1996 "Glazed Ceramic Tiles and Tiles. Fittings for internal wall".
- b] British Standard C.P. 212: for fixing methods and workmanship.

13.2.1 Joint Filling:

Joint Filler shall be white Portland Cement grout which shall bond dry tile, shall be non-shrinking, stain resistant, permanent in colour, and shall not inhabit fungus and bacterial growth. It shall be odorless and non-toxic of smooth consistency for easy preparation and neat, rapid installation, and shall contain non-metallic material. Grout shall be water resistant and shall not wash out under water.

13.2.2 Adhesives:

Adhesives for ceramic tiling if required as specified in the British Code of Practice C.P. 212 or Dry Bond Floor and wall thin set mortar as manufactured by Shabbir Tile and Ceramics Limited or equivalent approved.

Tiles shall be laid with floating coat of cement slurry and grouted in cement. If adhesive required essentially for proper execution of the works it shall be used as per instructions of the manufacturer and approved by the Engineer. No extra cost shall be made in this respect.

13.2.3 Samples and Tests:

The samples shall be furnished in sizes and Colours and adequate in number for testing in an approved laboratory.

13.3 WORKING DRAWINGS:

The Contractor shall prepare working drawings on the basis of working drawings for all the ceramic tile work to be carried out. These drawings will show clearly the sizes, method of fixing, jointing and the anchorage to be used in the process and the Contractor shall get approval in writing well in time before the actual start of the work.

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13.4 CONSTRUCTION REQUIREMENTS:**a] In Cement Sand Mortar:**

Surfaces to receive the ceramic tiling shall be clean and free of dirt, dust, oil, grease or other objectionable matter. Setting beds and tile shall be installed with their respective surface to true planes, level or pitched to off-sets as required by the drawings, so that the surface of the completed tiling work will be at the elevations and grades shown. Re-tempering of mortar will be at the elevations and grades shown. Re-tempering of mortar will not be permitted. Tiles shall be laid out from the centre lines of each space outward and adjustments made along walls, partitions and borders, if any, so as to symmetries the pattern with a minimum of cut tiles.

Joint between the tiles shall be of uniform width and the same as the tile installed. Fractional changes in dimensions without varying the uniformity of joint widths shall be permitted. Tile shall be cut with a suitable cutting tool and rough edges shall be rubbed smooth. Cut-tile misfits shall be laid to the straight edges. Straight edges shall be accurately set to the lines established and reset at suitable intervals to keep the joints parallel over the entire area.

Over the existing bed a topping of 1-1/2" thick PCC 1:2:4 shall be laid. Scratch coats for application as foundation coats shall be not less than 5/8" thick and shall be composed by volume of 1 part Grey Portland Cement to 3 parts dry sand, mixed with the minimum amount of water necessary to produce a workable mass. Mortar for scratch coats shall be used within one hour after mixing and re-tempering will not be permitted. Scratch coats shall be applied in sufficient quantity and with sufficient pressure to cover the entire area and to form good keys, shall be deeply scoured or scratched and cross-scratched, shall be protected and kept moist during the curing period. Scratch coats shall be thoroughly damp-cured, and an interval of not less than 24 nor more than 48 hours shall be permitted between application of scratch coats and application of float coats.

Float coats shall be composed by volume of - part Grey Portland cement to 2 parts dry sand, mixed with a minimum amount of water necessary to produce a workable mass. Float coats shall be applied in sufficient quantity to entire area and to form a good key, shall be brought out flush with the temporary screeds or guide strips so placed as to give a true even surface at the proper distance from the finish suitable for reception of files.

Joints shall be straight, level perpendicular and of even width throughout. Vertical joints shall be maintained plumb for the entire height of the tile work. Each tile shall be brought to true level and plane by uniformly applied pressure under a straight edge or rubber faced block. Tiles that are out of true plane or misplaced shall be removed and reset. Damaged or defective tile shall be replaced. The tile shall be installed as follows:-

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Wall tile shall be set by troweling a skim coat of neat Portland Cement on the float coat or by applying a skim coat to the back of each tile unit and immediately floating the tile into place. After tile has set remove mortar using a minimum of water. Replace damage tiles.

After the tiles have been thoroughly set, joints shall be grouted full with a plastic mix of neat, white cement immediately after a suitable area of tile has been set. The joints shall be struck flush and excess mortar shall be cut off and wiped from the mortar joints after grout has been cleaned from the surface shall be roughened at once and filled flush with the tile edge, before the mortar begins to harden. Tile skirting and coves shall be solidly backed with mortar.

b] In Thin Set Mortar:

Tiles laid in Thin Set Mortar shall be applied as per details shown on drawings and shall consist of a P.C.C. base of specified thickness. Tiles shall be set by troweling a skin coat of Dry Bond Mortar on the base coat and combed with a notched edge of trowel. Back butter each tile unit to ensure 100% mortar coverage and float the tile into place, tapping the tile to ensure maximum bond strength. All other installation requirements shall be as per specifications mentioned above.

13.5 MEASUREMENT:

The measurement shall be made in Sq. Ft/M of the actual surfaces completed and approved.

13.6 RATE AND PAYMENT:

The payment shall be made at the unit rates per Sq. Ft/M. stated in the Bill of Quantities.

Such payment shall constitute full compensation for all materials, equipment labour including all incidentals, necessary to complete the work. The cost of PCC base is included in the cost of tile work.

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14.1 DESCRIPTION:

The work covered under this section of Specifications consists of furnishing all labour and materials and performing all operations in connection with installation of all will work, construction, assembly and surface finish treatment, building in of all cabinet type of items, complete in every respect, including all related items, supports etc. of wood or metal and incidentals, associated wood work appurtenances, the application of all 'Hardware' in connection with finished wood work, in strict accordance with requirements of Drawings, as specified herein subject to the terms and conditions of the Contract Documents. The work under this section shall further conform to the requirements of the British Standard Codes of Practice, e.g. Cp. 151:Part 11:1957, CP.112.100:1952 and the British Standard relied therein and/or bearing relevance to this item of work.

14.2 MATERIALS:**14.2.1 Timber:**

Materials for the work included in this section shall conform to the following:-

i) General Characteristics:

The timber shall be in accordance with the requirements of BS: 1186 'Quantity of Timber and Workmanship in Joinery', Part-1, 'Quality of Timber'.

First quality timber shall be from the heart of a sound tree, the sap wood being entirely removed, the wood being uniform in substance, straight in fiber, free from large or dead knots, flaws, shakes or blemishes of any kind. The colour of good timber shall be uniform through out and among colored timbers; darkness of colour is an apparent indication of strength and durability.

For first quality teak wood, the size of the knot shall not be more than 1/2" and there should not be more than one knot in every 4 Sft. of timber.

For first quality deodar wood, the size of the knot shall not be more than 1" and there shall not be more than one knot in every 4 Sft. of timber.

ii) Seasoning of Timber:

Timber shall be properly seasoned. It shall be kiln or air dried to reduce the moisture content to a minimum of 20% of its natural weight.

The methods of seasoning timber are as follows:-

a) Air Seasoning:

This consist of sawing the logs into planks or rectangular sections of convenient size for use and stacking them in such a way that air can circulate around the wood, preferable in open sided sheds. The moisture contents will be reduced to about 15%. The time depends on the type of

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wood, its thickness and the weather. Generally, soft wood takes 2 to 3 months and hard wood about 8 to 12 months for every inch thickness.

b) Kiln Seasoning:

This process consists of drying the wood in a kiln. The process consists of fanning a blend of warm dry air and warm moist air over the wood at a controlled humidity. Kiln drying is preferable for internal joinery and furniture as air seasoning does not reduce the moisture contents sufficiently to ensure a stable equilibrium. Time taken to kiln-dry hard woods varies from a few days in the case of thinner board's upto 3 to 4 weeks for 3 inch planks.

iii) Preservation of Timber:

Preservatives may be applied in a variety of ways including pressure impregnation, hot and cold open-tank treatment, sleeping, dipping, brushing and spraying depending upon the use of timber and class of the preservative treatment according to the British Standard Code of Practice CP: 98:1964. Local proprietary products of chemical wood preservatives under the label of "WOOD GUARD" or equivalent shall be used along-with their implied methods of use etc.

iv) Timber Quality:

The requirements set forth in BS: 1186, Part 1, shall serve as a general guide in selecting timber including ply wood of suitable quality.

v) Adhesives:

For joiners work animal glues complying with BS: 745, 'Animal Glues for Wood' casein glues complying with BS:745, 'Cold Setting Synthetic Resin Adhesives for Construction Work in Wood' shall be used. For flush doors and other forms of construction that rely mainly upon the adhesive, and particularly where exposure conditions are severe and prolonged dampness is likely to occur, one of the more moisture resistant shall be employed, the choice depending upon the severity of the conditions to which the work will be exposed.

vi) Nails and Screws:

For joiners work, wire nails oval, chequered head, lost head round or panel-pins complying with BS:1202, 'Wire Nails and Cut Nails for Building Purposes' or wood screws in accordance with BS:1204 shall be used. The gauge of nail or screw used shall be suited to the woods being fixed and to which a fixing is being made, and the length shall be such as will give a sufficiently strong and secure fixing. CP:112. The Structural Use of Timber in Buildings' shall be followed which gives relation ship between gauge, amount of penetration and strength. All nails and screws used with reactive timber (becoming stained and disfigured by reaction with ferrous metals) shall be of non-ferrous metals or shall be protected

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in some manner before use if the wood work is likely to be subjected to moist conditions, e.g. external doors.

14.3 Ply Wood:

BS:565:1963 Section 5, 'Glossary of Terms Applicable to Ply Wood', defines ply wood as 'an assembled product made up of plies and adhesives, the chief characteristic being the crossed plies which distribute the longitudinal wood strength'. The term ply wood in general sense includes similar products such as laminated board, block board and batten board. BS:1455:1963 shall be used for acceptable standards of ply wood.

i) Three Ply and Multiple Ply Wood:

Three ply construction s include a 'face' a 'back' and a core or inner ply. Multiply includes a face, a back and a core of three or more inner plies. With very few exceptions the grain of each veneer in the core runs at right angles to that of the veneers on either side of it.

The construction of ply wood may be balanced with an odd number of veneers arranged symmetrically r unbalanced. The tendency of the finished board to distort is reduced by adopting a balanced construction.

The construction may vary for a given panel thickness by the inclusion of veneers of various thickness. This will affect the strength properties.

Ply wood according to BS:1455:1963 is classified into two main types, viz interior and resin bonded.

Interior type ply wood is suitable for most interior work including flush doors, door panels wall paneling, balustrades, sub-flooring, kitchen figments, and any location where resistance to moisture is not required. Adhesive used include casein, soya, blood albumen and animal glues as will as synthetic resin extended with other substances.

Synthetic resin bonded ply wood while being suitable for the same purpose as interior type, has a much greater resistance to moisture. The more resistant types are suitable for external flush doors and door panels, wall sheathing, shop front fascias, sign boards, shuttering and form work for concrete and for any purpose where it may be exposed to moisture. Adhesives used include urea, melamine phenol and resorcinol formaldehyde (arranged in order of increasing moisture resistance).

The CONTRACTOR shall procure ply wood according to various grades specified in BS: 1455: 1963 "Ply Wood Manufactured from Tropical Hard Woods" and are briefly given as under for guidance.

Grade 1 Veneer: Shall be of one or two pieces of firm smoothly cut veneer. When of two pieces, the joint shall be approximately at the centre of the board. The

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veneers shall be free from knots worm and beetle holes, splits, dots, glue-stains, filling or inlaying of any kind or other defects. No end joints are permissible.

Grade 11 Veneer: Shall present a solid surface free from open defects. Veneers, when jointed need not necessarily be matched for colour or be of equal width. A few sound knots are permitted with occasional minor discoloration and slight glue stains, isolated pin holes not along the plane of the veneer. Occasional splits not wider than 1/32 inch and not longer than 1/10 of the length of the panel or slightly opened joints may be filled with suitable filler. No end joints are permissible.

Grade 111 Veneer: May include wood defects including work holes which are excluded from Grade 1 and 11 above in number and sized which will not impair the serviceability of the ply wood. It may also include manufacturing defects such as rough cutting, overlaps, gaps or splits provided these do not affect the use of the ply wood. No end joints are permitted.

The uses, from which ply wood made with the grades defined above are considered useful, are outlined hereunder:

Grade 1 For use in its natural state.

Grade 11 For use where subsequent painting and / or veneering is intended.

Grade 111 For use where it is not normally visible.

Under the Specifications where combinations of above grade are required, these combined grades may range from 1/11, 11/111, as additional grades of these Specifications.

ii) **Laminated Board:**

This is built-up board, with narrow strip 3 to 7 mm wide, faced both sides with either one or two veneers from 1.2 mm to 3.7 mm thick. Where single or double face veneers are used, the grain usually runs at right angles to the grain of the core strip this type of board when available varies between 1/2 inch to 1 inch and is an ideal base for the highest class of veneered wood. For detailed Specification, BS:3444: 1961, 'Block Board and Laminated Board' shall be used.

iii) **Block Board:**

This board is of similar construction to laminated board but core is built-up of blocks upto 1 inch wide. It is used as a base for veneering and for painted work but is considered slightly inferior to laminated board for the former use. The range of size and thickness in which it is manufactured are similar to those of laminated board. For detailed Specifications BS: 3444: 1961, 'Block Board and Laminated Board' shall be used.

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iv) Fabrication:

Ply wood can be worked by all normal wood working tools, both hand and machine and can be fixed by panel pins, screws, rivets, gluing, grooving, into framing, tonguing and grooving and by metal tooth plate or spilt ring connectors. For exterior work, galvanized and copper nails and also water-proof adhesives shall be used.

14.4 Boards:

The proprietary boards are known as fibre building boards and chip boards or particle boards. The fibre boards include hard boards insulation boards and straw boards. These boards follow the description in the following order:

i) Fibre Building Boards:

Fibre building boards form the largest category with the number of different types as detailed hereunder:

a) Hard Board:

Density from 30 to 50 lbs per cft. There are three main sub-divisions, being medium (30-50) lbs per cft. Standard medium (50 lbs per cft.) tempered hard board/standard hard board treated to increase hardness and resistance to water.

b) Insulation Board:

Maximum density 25 lbs pe cft. Minimum thickness 7/16 inch, maximum thermal conductivity (k) 0.45. They have five sub-divisions, viz: homogeneous, laminated bitumen bonded, bitumen impregnated, acoustic (of low density and specially designed often with perforated surface to increase sound absorption). These boards have good qualities of thermal insulation and sound absorption and are of qualities of thermal insulation and sound absorption and are recommended accordingly.

c) Straw Boards:

These are compressed straw slabs, consisting of straw formed into slabs 2 inches thick by heat and pressure and with proprietary paper glued to the sides. Edges too are bound with paper. The slabs are fairly stiff and have thermal conductivity (k) of 0.6.

ii) Wood - Chip Board (Particle Board):

Chip boards are made from wood particles in the form of chips or shavings of a controlled size combined with a thermosetting synthetic resin glue binder and formed into panels under the influence of mechanical pressure and heat. The process of adhesion is controlled resulting in a variety of boards with different

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but predictable physical proper ties. Chip board lends itself well to uses such as sheathing, flooring and sub-flooring, wall paneling, partitions, shelves, furniture and veneered boards, core stock. It is little affected dimensionally by changes in atmospheric humidity, but in wet conditions it has a limited resistance to moisture.

The mechanical strength properties are good fro high density boards. In the density range 30.55 lbs/cft typical value of thye modulus of rupture lies between 1500 to 3000 lbs/sq. inch. An average value for the modulus of elasticity is 3000,000 lbs/sq. inch.

The surface finish of standard boards is comparatively rough, and to support a good quality paint or varnish finish requires sanding and filling. Special grade of the board are prepared for painting which have a paper surface permanently bonded to the board during manufacture.

Particle boards are made in grades of high, medium and low density but the bulk production has been of medium density mainly in thickness of 1/2" and 3/4". These Specifications rely on BS: 2504:1963, 'Medium Density Resin Bonded Wood Chip Board' for quality of the board and requirements for density, strength and other properties. The density range of this board is from 30 lbs/cft to 50 labs cft thermal conductivity is of the order of 0.7 to 1.0 B.T.U. in/ft. 2/in °F, BS:18111961 will be relied upon for testing of the wood chip board.

14.5 CARPENTRY WORK

14.5.1 General:

All work specified in the Bill of Quantities and shown on working Drawings and details is to be carried out in proper manner. The CONTRACTOR has to provide all loose planks, battens, trestles and ladders and to construct all scaffolding necessary for the proper execution of the work and to remove the same on completion.

14.5.2 Preservative Treatment:

Where preservative treatment is specified, the timber is to be of the correct moisture content and free from surface moisture and dirt. In general, all portions of timber built into or against or close to masonry or concrete, and all junctions or rafters, purlins, framing ascriber pieces and wall plates etc. shall be given two coats of hot solignum, creosote or other wood preservative or as approved. Preservative material shall be applied in strict accordance with recommendations of the preservative manufacturer and shall be given to all wood work which comes in contact with or built into any wall, floor, ceiling or any other structure. All rough wood work which is not the finished and exposed wood work whether abutting any structure or not shall be given a preservative treatment. No extra payment shall be made for such coasting and will be considered inclusive in the rate of the respective item quoted by the Contract. Treatment is to be carried out after all cutting and shaping is completed and care is to be taken to avoid damage. A liberal application of preservatives is to be made to cut or damaged surface, CP

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112:100:1952, 'Preservative Treatment for Timber used in Buildings, shall be relied upon regarding preservatives and methods in relation to uses of timber.

14.5.3 Moisture Content:

The timber prior to preservative treatment is to be properly seasoned. Timber fit for carpentry is considered seasoned when it loses 1/5 of its weight and fit for joinery when about 1/3 of its weight has been lost after felling.

14.5.4 Workmanship and Construction:

'Unwrought' timber shall be 'left from the saw', and shall be full to the dimensions stated except that occasional slight variation in sawing is permissible.

All framing shall be jointed as specified and/or as determined as most appropriate in the circumstances. The joints shall be as per standard practice depicted through architectural details and constructed so that load and stresses to which they will be subjected are properly transmitted.

Unless otherwise stated all joints shall be secured with a suitable type and sufficient of nails. A butt joint shall, wherever possible, be secured with nails driven from the far side of the flanking member, if any. The joining surfaces of all connections exposed to the weather shall be thickly primed except where adhesives are specified. Where joints are designed in critical relation to loads, the size, spacing, type, positioning and number of nails, wood screws, bolts, washers and timber connectors shall be provided by the CONTRACTOR true to design details.

14.5.5 Procedure:

The operations shall be planned and coordinated keeping in view the requirements and convenience of all tradesman concerned in the work.

The CONTRACTOR shall order materials for sizes and quantities as required to complete the job as per working Drawings and details. All work is to be set out and constructed to the dimensions given and as described on the Drawings and details.

14.5.6 Protection of Materials:

All materials and assembled units shall be protected from the weather and stored in such a way as to prevent attack by fungus, decay and/or insect.

14.5.7 Inspection:

Facilities shall be provided to inspect all work in progress in the work shops and on Site. All work under this section should be first Approved before being fixed in the building.

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14.6 JOINERY WORK**14.6.1 General:**

All work specified in the Bill of Quantities and shown on working Drawings and details shall be carried out in proper manner. The CONTRACTOR shall manufacture, deliver to Site and fix in place all joinery including supply and fixing of metal, strap, lugs and dowels, priming, preservatives, polishing and all hardware specified and/or shown on the Drawings. Except where special finish is specified the joinery work shall be cleaned and scrubbed. The CONTRACTOR shall leave whole of his work in good order.

14.6.2 Preservative Treatment:

Same as in Clause as above 14.5.2.

14.6.3 Moisture Contents:

Same as Clause as above 14.5.3.

14.6.4 Priming:

Where priming is specified, the timber shall be coated with a thick mixture of red or white lead and linseed oil and priming shall comply with BS:2521:1954. The CONTRACTOR shall provide for priming and touching up primer where necessary during the progress of work.

Aluminum base primers may be used when timber is particularly resinous. Where synthetic paints are used, Manufactures must be consulted on the type of primer.

14.6.5 Workmanship and Construction:

All "Wrought" timber is to be swan, planed, drilled or otherwise machined or worked to the correct sizes and shapes shown on the drawings and/or specified.

The arrangement of jointing and fixing of all joinery work shall be such that shrinkage in any part and in any direction shall not impair the strength and appearance of the finished work. Reasonable tolerance shall be provided at all connections between joinery works and the building Caracas, whether of masonry or R.C.C. frame construction, so that any irregularities, settlements or other movements shall be adequately compensated.

The joiner shall perform all necessary mortising, tenoning, grooving, matching, tonguing, rebating and all other works necessary for correct jointing. He shall also provide all metal plates, screws, nails and other fixings that may be necessary for the proper execution of the joinery works specified. The joiner shall also carry out all works necessary for the proper construction of all framings linings, hold-fasts and other contrivances as per architectural details for their adequate support and fixing in the building.

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Loose joints are to be made where provision is required to be made for shrinkage or other movements acting in the direction other than that of the stresses because of loading. Glued joints are to be used where provision need not be made for shrinkage or other movements in the connection, and where sealed joints are required. All glued joints shall be cross-tongued or otherwise reinforced. All bails, springs etc. shall be punched and puttied. All cutting edges of tools shall be sharp to avoid burnishing.

All wood work, as far as practicable, shall be assembled in shop, finished and prime coated before delivery for fixing. In addition to machine sanding, all woodwork shall be smoothed by hand using "00" sand paper to obtain the required smooth surface, free from machine and tool marks, abrasions, raised grains and other undesirable defects. All wood work shall be fitted to plaster and other finished work in a careful manner so as not to injure these surfaces. Where plaster or other work is damaged or disturbed, it shall be restored to its original state by the CONTRACTOR at no additional cost.

All wood work shall be neatly finished to the exact dimensions specified. All nails and screws shall be of approved type. Hammer shall not be used for driving in or starting in the screws. All screws shall be dipped on oil before they are inserted in the wood. The heads of nails or screws shall be sunk and puttied or dealt with as directed.

The CONTRACTOR shall give at least 7 days notice in writing before any timber is to be covered in the ground or in walls or otherwise.

14.7 DOORS

14.7.1 Door Frames:

Door Frames shall be fabricated of first class Deodar wood if specified according to design, size and sections shown in the Drawings. The wood shall be smoothly planed and all the joinery shall be perfect and strong.

The frames shall be secured to masonry or concrete with M.S. hold-fasts 9" to 3" long of type approved. These hold-fasts shall be screwed and not nailed to the frames. The hold-fasts shall be free of dust, scales, rust etc. and shall be painted with 2 coats of anti-corrosive paint before they are secured to masonry or concrete. The hold fasts shall be cast in concrete work. The minimum number of hold fasts used shall be (3x2) unless otherwise specified.

14.7.2 Flush Doors:

The Flush doors shall be obtained from approved manufactures and shall be of the quality and kind as per these Specifications and of dimensions as shown on Architectural Drawings and shall comply to the requirement of Pakistan Standard No. 142 of 1961.

Flush doors shall be constructed of plywood as specified earlier. It shall be synthetic resin bounded ply wood suitable for both internal and external flush doors and shall be

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of the grades 1 and 11 as specified earlier. The facing shall be teak or commercial ply as specified.

The core shall be made up of solid laminated wood or as specified and shown on drawings. It shall have 3" wide solid wood edge rail of deodar wood all around and lock block of minimum 10" wide. The shutter shall be lipped and edged all around with hard wood. The core shall be chemically treated to be antitermite without affecting the inherent qualities of the core material and shall be fabricated with the grain running parallel to the grain of face veneer. Core material shall be accurately machined on all sides to ensure tight fitting core, free of voids throughout the core assembly.

The adhesives used in the door manufacture shall be special urea-resin type (liquid or powder), unaffected by oil, gasoline, solvents, resistant to the growth of fungus and bacteria, immune from insects and shall be such as to remain unaffected by paint and lacquer approximately 60% of solids content.

14.7.3 Fitting, Hanging and Trimming

Doors shall be fitted, hung and trimmed as indicated on the Drawings. Hinges shall be counter sunk into the door frames as well as leafs. The recesses being cut to the exact size and depth of the hinge. No subsequent packing shall be allowed. Brass screws shall be used with brass fittings unless otherwise specified. Hard ware shall be fixed as specified in the drawings. Locks and other hardware items shall be fixed at heights as shown on the Drawings or as directed.

14.8 HARDWARE:

Items of hardware specified in the Drawings shall be carefully fitted and securely attached on completion of the work. Hardware shall be demonstrated to work freely, keys shall be fitted into their respective locks and upon acceptance of the work and keys shall be tagged and delivered in duplicate. No separate payment shall be made for hardware fittings and fixture.

14.9 MADE GOOD DEFECTIVE WORK:

Should any shrinkage or warping occur or any other defects appear in the joiner's work, such defective work shall be taken down and replaced any other work disturbed shall be made good at the CONTRACTOR's expense.

14.10 SAMPLES:

The CONTRACTOR shall furnish 2 Nos. samples free of cost for approval of each fitting to be used prior to its use.

14.11 MEASUREMENT:

The measurement shall be made in Sq. Ft/M of the actual surface completed and approved.

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14.12 RATE AND PAYMENT:

All wood work shall be paid at the rate as per complete item entered in the Bill of Quantities. Such payment shall constitute full compensation for all material, equipment, labour including all incidentals, necessary to complete the work including fly proofing, glazing, iron mongery and painting etc.

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15.1 DESCRIPTION:

The work covered under this Section consists of providing and constructing the following works:-

- Marble Tile Work
- Vitrified Tile
- Tuff Tile
- Concrete Paving/Roads

15.2 MATERIALS:

15.2.1 Cement; Sand Aggregate shall conform to the standard specifications given in the relevant Section of "Materials".

15.2.2 Marble Tiles shall be Malagori or Lasbela as indicated on drawings and B.O.Q. For details Refer section "Marble Tile Work".

15.2.3 Vitrified Tiles: shall be of "Marble" or approved equivalent.

15.2.4 Tuff Tiles and Kurb Stone shall be as per manufacture's specification.

15.3 CONSTRUCTION REQUIREMENTS:

The entire area external pavings shall be prepared by dressing earth to a hard or graded surface. Where necessary, the prepared surface shall be made upto the required levels by filling and consolidating earth in accordance with the specifications for earth filling under floors.

15.3.1 Marble Tile Work:

Marble Tiles of size and thickness as indicated on drawings and BOQ shall laid at places shown in cement sand, mortar 1:3 using grey cement and grouted by polysulphide sealant. For details refer Section of Marble Tile Work.

15.3.2 Vitrified Tile Work:

Vitrified Tiles (National or equivalent) of sizes and thickness indicated on the drawing and BOQ shall be laid in cement sand mortar (1:3) using grey cement and laid over 38mm thick plain cement concrete (1:2:3) over lean concrete 1:4:8, 100mm thick.

15.3.3 TUFF TILE PAVERS AND KERB STONE:

Uni-Block Tuff Pavers and Kerb Stone (M/s Izhar, Tuff Power or equivalent) shall be installed over Parking Areas and Roads, the area under the paver and Kerb Stone shall be prepared to the required levels by compacting the earth to at least 95% modified AASHO max. Dry density, the compacted earth shall be tested and approved before

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the layer of sand is placed. The prepared sub-grade shall then be covered by 6" of sand cushion for Tuff Power compacted packed tamped in place and filled with sand Kurb Stone be laid over (91:4:8) base and jointed with C-S mortar (1:2).

15.3.4 Concrete Paving / Roads: This shall be of two kinds:

- a. Concrete Roads
- b. Carpet Roads

15.3.5 Concrete Road

Earth shall be compacted to 95% AASHTO density and 100mm thick cement concrete 1:4:8 shall be laid. Over it base course of 100mm thick cement concrete (1:2:4) shall laid using stone crush.

15.3.6 Carpet Road

Earth work shall be compacted to 95% AASHTO density and 15mm thick sub-base course of cement concrete 1:4:8 shall be laid. Over it base course of 100mm thick cement concrete (1:2:4) shall laid using stone crush.

15.4 CURING:

All work involving cement shall be cured thoroughly for at least 7 days.

15.5 MEASUREMENT:

Measurement for all the items covered under this Section shall be made in Sq. Ft/m of the actual surfaces completed and approved for kurb Stone shall be made in Ft/m if separate payment specified.

15.6 RATE AND PAYMET:

The rate quoted for work items covered in this Section shall constitute full compensation for all materials, labour, equipment, plant and all incidentals to complete the works.

<u>PAY ITEM NO</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
15.6 (a)	Marble Tile Work	Sq. m/Ft.
15.6 (b)	Vitrified Work	Sq. m/Ft.
15.6 (c)	Tuff Tile Work	Sq. m/Ft.
15.6 (d)	Concrete Paving/Road	
	• Concrete Road	Sq. m/Ft.
	• Carpet Road	Sq. m/Ft.
15.6 (e)	Kurb Stone	RM/Ft.

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16.1 DESCRIPTION:

The work covered under this section of Specifications consist of furnishing all materials, labour and performing all operations in connection with plastering/rendering complete in every respect in accordance with the requirements of the Drawings and Specifications, and as directed.

The work carried under this section shall further conform to the requirements of the British Standard Codes of Practice CP:211:1966 and CP:221:1960 and all the British Standard and other Documents relied therein.

16.2 GENERAL:

Except as may be otherwise or specified, all plaster shall be cement sand plaster. Plastered ceilings and walls shall include partitions, piers, columns, pilaster, plastered jambs and other returns, reveals and backs of recesses, alcoves, and jambs and heads of windows and doors, unless otherwise specified or shown on Drawings. Plaster work shall also include all plaster work on and under all concrete surfaces to be left exposed and concrete not required Fair Faced, until and unless specified otherwise. It would be the CONTRACTOR's responsibility to ensure that all electrical conduits, hidden or items to be embedded, ducts, pipes, brackets, doors, windows, ventilators and all other fixtures on walls, ceiling, columns or required elsewhere have been fixed in place before the plastering is started.

16.3 MATERIALS:

16.3.1 Portland Cement shall be described in section 5 "Portland Cement Concrete".

16.3.2 Sand shall comply with the requirements of ASTM designation C35. British Standard 1199, Table 1.

16.3.3 Water shall be clean, free from harmful amounts of deleterious matter and from any unusual proportion of dissolved salts. Sea water, tidal estuary or brackish water shall not be used.

16.3.4 Metal lathing used as back ground for plastering should not weigh less than three (5) lbs/sq. yard for sanded plaster and (3) lbs/sq. yard for light weight gypsum plasters and shall comply with B.S. 1369 Metal Lathing (steel) for Plastering.

16.3.5 Galvanized wire netting where required to provide a mechanical key, 22 SWG galvanized wire netting of mesh not greater than 2" and complying with BS 1485, 'Galvanized Wire Netting' shall be used.

16.3.6 Barites: For Barium Sulphate plaster, barium sulphate fines shall be used.

16.4 PROPORTIONING OF PLASTER

16.4.1 All plaster shall be Portland Cement plaster, except otherwise specified and shall be mixed in the proportions by volume as indicated on Drawings.

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Volume batching shall be done by proper gauge boxes and not by the shovel-full

16.4.2 Mixing:

Plaster ingredients in the specified proportions shall be thoroughly mixed by Mechanical means.

- 16.4.3 All coats of plaster in liquid retaining structures shall be water-proofed by the addition of an Approved compound in liquid or solid form used at an Approved dose. The water-proofing compound shall be commercially pure with no oils or other ingredients which may be detrimental to the cement.

16.5 CARE OF TOOLS AND PLANT

- 16.5.1 All tools shall be cleaned by scrapping and washing at the end of each day's work, or between uses with different materials. Metal tools shall be cleaned and if necessary greased after each operation. All tools shall be examined and thoroughly cleaned before plastering is begun.

16.5.2 Gauge Boxes:

Gauge boxes shall always be used for proportioning plaster mixes by volume and shall be kept clean.

16.5.3 Mechanical Mixers:

Gauge boxes shall be mixed for two or three minutes, after which the batch shall be discharged and not left in the mixer. When the mixer is not in continuous use, it shall be washed out after every mix as soon as the batch is discharged. When in continuous use the mixer shall be washed out about four times a day.

16.6 CLEANLINESS AND PROTECTION:

Cleanliness is essential in carrying out plaster work. Adequate protection shall be given to all existing work and fittings which are liable to be damaged not only in the areas of plastering operations but in the approaches thereto by covering up with boards, dust sheets etc. as necessary. This is particularly important when mechanical methods of application are used.

On completion, all works affected by plastering operations shall be left clean. Special care will be taken when removing set plaster from glass to avoid damaging the surface.

16.7 FIXING APPLIED BACK GROUNDS

16.7.1 Metal Lathing:

Metal lathing shall weigh not less three (5) lbs/sq. yard for sanded plaster and shall be protected by black bitumen paint or be galvanized.

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All metal lathing shall be of 3/4" or 1" mesh and be fixed with the longway of the mesh across the supports. Metal lathing with stiffening ribs with the ribs uppermost towards and across the supports. If the supports are more than 14" apart, the gauge of metal shall be increased above that normal used to give sufficient stiffening.

The strands in various sheets shall all slope in one direction; in vertical work they shall slope inwards and downwards from the plaster face.

— Metal lathing minimum 8" wide to be fixed at the junction of RCC elements and block brick work shall be fixed by galvanized nails or staples at 4" centres. End laps shall not be less than 1" when laps occur in the bearers and not less than 2" when the laps occur between bearers. They shall not occur at angles or grooves and shall preferably occur only at supports. The sheets shall be lapped and security tied together with 18 SWG galvanized tie wire.

Side laps shall be less than 1" and wired together with similar gauge core wire at 16" centre. Metal lathing shall be as taut as possible, this is best achieved by nailing the sheet in the centre and then working towards each end. Ends of wiring for fastening shall be bent inwards and not towards the plaster coat.

After erection all cut edges and damaged metal lathing, staples or nail heads shall be given a protective coat of bitumen paint.

16.8 BACK GROUNDS

16.8.1 Characteristics of the Back Ground:

The back ground shall not have received any prior treatment such as painting or impregnation which is incompatible with adequate bond.

16.8.2 Preparation of Back Ground:

Preparation Treatment: The preparatory treatment as necessitated for the application of plastering systems shall be as per British Standard Code of Practice and/or as instructed.

16.8.3 Treatment of Mixing Back Ground:

Where plastering is to be continued across back grounds of different classes, expanded metal shall be fixed across the junction to minimize cracking due to differential movements. Where small width of one material is involved e.g. concrete expanded metal over building paper into the material abutting the concrete in order to isolate the plaster from any movement of the column.

16.9 APPLICATION OF THE VARIOUS COATS

16.9.1 General:

The work shall not be started until the back is in a proper state as specified, and suitable weather conditions prevail. As far as practicable, it is important that a newly rendered surface shall be prevented from drying out too rapidly, although protection from the sun

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and wind or spraying with water, may only be necessary in hot and dry weather. In sunny weather, the work shall be carried out in the shade whenever possible, following the sun, as the day passes. Under coat shall be allowed to dry out for as long as possible before the subsequent coat is applied. It is desirable to wait at least twenty four (24) hours even in the hot dry weather. Before applying any subsequent coat, the preceding coat shall be brushed down to remove any dirt and loose particles and, if of a porous nature and very dry, shall be wetted.

When rendering on metal lathing or expanded metal, back rendering, wherever to can be applied, shall be done when the first under coat on the face is hard enough to permit. The work shall then be allowed to dry as completely as possible before applying further coats, in order to prevent cracking.

When specified plaster thickness is 3/4" or more plaster shall be applied in two (2) coats on block/brick masonry and concrete surfaces. Unless otherwise indicated on the Drawings or directed the plastering shall be carried down to the skirting of the floor.

16.9.2 Undercoat:

This may be applied either by laying on with or throwing from the trowel. The surface to receive the under coat shall be thoroughly cleaned and evenly dampened before the plastering begins.

The undercoat shall be as uniformly thick as possible and in no case shall be more than 5/8" thick in any one trowel laying. After it has been left long enough to set firm, the surface shall be combed or scratched, care being taken to leave the scratch marks sufficiently deep to provide a key for the following coat but not so deep as to penetrate the rendering.

It shall be applied with sufficient pressure to fill the raked out joints in block/brick work to prevent air pockets and to secure a good bond. It shall be kept moist with fog spray for two (2) days and then be allowed to dry out.

16.9.3 Finishing Coat:

Finishing Coat shall not be applied until the undercoat has been cured for seven (7) days. Just before application of the finish coat, the under coat shall again be wetted evenly with a fog spray.

It shall not be less than 1/4" or more than 3/8" thick and shall be applied with laying trowel and finished with a wood, felt cork, or other suitably faced float.

A steel trowel shall not be used and over working shall be avoided. Water shall not be applied to the surface of the finishing coat whilst working up, but patches showing signs of premature drying may be patted with a damp float.

It shall be kept moist with a fog spray for at least two days and thereafter shall be protected against rapid drying until properly and thoroughly cured.

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16.9.4 WATER PROOF PLASTER FOR WATER RETAINING STRUCTURES:

All surfaces continuously exposed to wet conditions shall be given water proofing treatment.

The water proofing treatment shall be done in plaster by using water proofing cement compound (PUDLO) especially made for such purpose. It shall be applied as plaster in two successive layers of 3/4" each on all linear surfaces. The plaster shall be made by mixing the water proofing compound in the cement sand mix of 1:3 by volume according to the Manufacturer's instructions. Water proofing compound shall be allowed sealed containers only. Only approved water proofing compound shall be allowed for use. Minimum five (5) lbs of water proof plaster. In water tank at corners, vertical as well as horizontal shall have triangular cant strips 6" x 6" size in mortar 1:6. The surface to receive water proofing treatment shall be made rough by hacking and chiseling the concrete lightly give a rough surface for bonding. After the surface has been rough, metal lath (diamond mesh) shall be nailed to the entire surface in an Approved manner. The first layer of water proofing plaster 3/4" thick shall then be applied and its surface shall be made rough by the use of a brush or other suitable instrument. The first layer shall be allowed to cure for a minimum of forty eight (48) hours before the second layer of water proofing plaster with metal lath as in first layer is applied. The second layer of plaster shall also be 3/4" thick and its surface shall be trowel finished by means of steel trowel to give a smooth and even surface from the inside. The plaster shall be cured for a minimum of fourteen (14) days after laying of second layer of water proofing plaster. Water proofing plaster work shall not be started until all pipes have been installed. Any damage or leak discovered in the tank shall be repaired by the CONTRACTOR at his own cost.

16.9.5 SAMPLING OF PLASTER:

Samples may be taken at any time from plaster work in place for testing.

16.10 PATCHING:

Plaster containing cracks, blisters, pits, checks, or discoloration will not be accepted. Such plaster shall be removed and replaced with plaster conforming to this Specification.

16.11 MEASUREMENT:

All plaster work shall be measured and paid for the actual work executed paid for at the unit rates entered in the Bills of Quantities.

16.12 RATE AND PAYMENT:

The unit rate shall include the cost of furnishing all the materials, labour, scaffolding, appliances, tools and performing all operations in accordance with the specification, drawings and instruction. The cost of plastering shall be deemed to be inclusive of grooves, metal lathing, mesh and preparation of surfaces. The rate quoted shall be

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taken as full compensation for all services and materials to be provided for finishing the work and in connection thereto.

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18.1 DESCRIPTION:

Providing making and fixing steel doors, windows and ventilators single or double leaf, single shutter or double shutter, fully paneled or party paneled and include providing and fixing of wire gauze, glazing, all mongery fittings or fixtures if required and shown on drawings or a directed and conforming to the relevant B.S./ASTM Specifications.

18.2 MATERIAL REQUIREMENTS:

All materials steel sections, etc. shall comply with the specifications given in respective section: The steel sections shall be according to ones shown in the drawings and shall be free from injurious matter air-holes blows wounds spitted grains un-cleaned and blunt rises and crevices.

18.3 CONSTRUCTION REQUIREMENTS:

The steel sections shall be thoroughly straightened in the shape by methods that will not injure it before being laid off or worked in any way.

18.3.1 Cutting & Forming:

All members shall be so cut and formed that they can be accurately assembled without being unduly cracked strained or forced into position.

18.3.2 Jointing:

The jointing of different parts of the members of mild steel shall be carried out by welding process with the help of electric/hydroxyl flame. Welding points should be made quite smooth by filling them and should conform to the width stipulated in the relevant drawings.

18.3.3 Wire Gauze:

Unless otherwise specified or directed the 22 gauge, 12 x 12 mesh wire gauze shall be fixed.

18.3.4 Glazing:

Glazing shall be strictly according to the specifications given in respective section and shall be fixed as shown on the drawings.

18.3.5 Fittings Fixtures Etc:

All mongery fittings fixtures shall be of approved quality and shall be fixed as per standard practice or as per drawings. All the welding points shall be smoothened by filling and the heads of bolts sunken in the frame.

18.3.6 Fixing:

All the frames of doors and windows shall be fixed at site with the hold fasts of specified size and umber and as shown on drawings with proper alignment and plumb.

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18.3.7. All finished members must be free from twists bends or open joints and shall strictly be in accordance with drawings.

18.4 PRECAUTION PROTECTION:

Unless otherwise permitted in writing or if shown otherwise on drawings the steel windows shall be placed in position before the work reaches the gill level so that they can be built in as brick work as masonry proceeds. The Contractor shall taken care to protect the work from any damage of whatsoever nature during the construction period. In case of any such damage done to the work the Contractor shall remove replace or rectify such work at his own cost.

The windows shall be painted with primary coat of red oxide and good quality of double boiled linseed oil or any approved anticorrosive paint after proper grinding and two coats of synthetic enamel paint of approved make. No extra payment shall be made for such work.

18.5 MEASUREMENT:

The measurement shall be made in Sq. Ft./M of the actual surfaces completed and approved.

18.6 RATE AND PAYMENT:

The payment shall be made at the unit rates per Sq. Ft./M stated in the Bill of Quantities. Such payment shall constitute full compensation for all materials, equipment, labour including all incidentals, necessary to complete the work. The rate quoted shall deem to be inclusive of glazing, painting, fly proofing and iron mongery etc. No extra payment shall be made for such work.

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19.1 DESCRIPTION

The work covered under this section of Specifications comprises furnishing of all labour, plant, equipment, appliances and materials and performing all operations in carrying out and in connection with the furnishing and fixing of aluminum extruded metal cover assembly, retainer clips and metal covers over floors, vertical and roof expansion joints and all related items such as fastenings, bolts, etc. and other items supplied and customarily built-in and/or installed in strict accordance with the drawings, specifications and instructions.

19.2 MATERIAL REQUIREMENTS**19.2.1 Aluminum**

All aluminum extrusions shall be heat treated aluminum alloy conforming to B.S. 1474 1972 H.E.9. Any other material specified shall confirm the respective B.S. code.

19.2.2 Filler Material

Pre-molded expansion joint filler shall be of Sika, Forsrock Feb or an approved manufacturer and should conform to the requirements of the B.S. or ASTM standards.

19.3 CONSTRUCTION REQUIREMENTS

Floor expansion joints at locations, where shown on the drawings shall be provided with extruded Aluminum sections or any other metal specified on either side of the joints and the entire assembly covered with an extruded metal cover. The metal cover assembly shall be installed as shown. The extruded metal cover and retainer clips required at walls shall conform to the dimensions and shapes shown on the drawings and shall be attached to the wall with counter sunk head stainless steel machine screws spaced not more than 24" on center. The metal cover assembly at floors shall be attached to the floor with anchor bolts as shown on drawings. The free space on one side shall be filled with a compressible material of an approved manufacturer. The Aluminum cover assembly shall be as manufactured by Pakistan Cable, ALCOP and Lucky or approved manufacturer. Flexible bitumastic type filler material shall be provided at all roof and wall joints and the joints sealed before applying metal cover over expansion joints and fixed with Steel or specified Clips.

19.4 MEASUREMENT

Measurement will be made of the linear feet of expansion joint at all floors, ceilings, walls etc. and wherever shown in the drawings. Measurement will be made of the Lin. Ft/M. of the joint cover over the expansion joint on the roof ceiling and walls provided in accordance with the drawings.

19.5 RATE AND PAYMENT

Payment will be made for the number of Lin.Ft/M. measured as provided above for furnishing and installation of the cover, filler material, sealant retainer clips, extruded sections, screws, bolts and all other work related to the item. The anchor bolts, bars, joint filler sealant and compressible material etc. shall be included in this item for payment.

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20.1 DESCRIPTION

The work comprises of providing all labour, tools, equipments, to install, place and fabricate in position and locations rubber water stops together with all jointing and sealing material as per recommendations, specifications of the Manufacturer and instructions. All embodiment in concrete, lapping, turning, sealing shall ensure absolute water tightness subjected to any pressures. The workmanship and operation shall be perfect and guarantee leak proof at places wherever used in the structure.

20.2 MATERIAL REQUIREMENTS

Polyvinyle chloride water-stop shall be extruded from an elastomeric plastic compound, the basic resin of which shall be polyvinyl chloride (PVC). The compound shall contain such additional resins, plasticizers, stabilizers or other materials needed to ensure that when the material is compounded and extruded to the shapes and dimensions shown, it will have physical characteristics when tested by the U.S. Corps of Engineers Test Method specified below:-

Physical Characteristic	No. of Specimen Tested	Requirements	Test Method
Tensile strength using die III, not less than	5	1750 psi	68
Ultimate elongation using die III, not less than	5	350 %	573
Low temperature brittle-ness no sign of failure such as cracking or chipping at	3	(-) 35 F	70
Stiffness in flexure, 1/2" span, not less than	3	400 psi	571

20.3 CONSTRUCTION REQUIREMENTS

Splices the continuity or at the intersections of runs of PVC waterstops shall be performed by heat sealing the adjacent surfaces in accordance with the manufacturer's recommendations or as directed. A thermostatically controlled electric source of heat shall be used to make all splices. The correct temperature at which splices should be made will differ with the material used but should be sufficient to melt but not char the plastic. After splicing, a remolding iron with ribs at the splice. The continuity of the characteristic components of the cross-section of the water-stop design (ribs, tabular center axis, protrusions, and the like) shall be maintained across the splice.

The expansion joints wherever indicated on drawings shall have centre bulb rubber water-stops or its equivalent as indicated on drawings to be cast integrally with the insitu-concrete of retaining walls, beams, columns, slabs or at any locations marked on the drawings, incorporating junction places or as straight lengths with separate intersection pieces to be jointed at Site as per Manufacturer's recommendations and specifications. The water-stops shall be installed so as to hold them securely in their

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correct position during the placement of concrete. The concrete shall be fully and properly compacted around the water stops to ensure that no voids or porous areas remain. Where reinforcement is present adequate clearance shall be left between water stops and the reinforcement to permit proper compaction of concrete. No holes shall be made through any water stops. Hot or cold vulcanizing for jointing places of water-stops at site shall be done with the prior Approval in accordance with the Manufacturer's recommendations and specifications.

20.4 MEASUREMENT

Measurement will be made of the number of Lin.Ft./M. of polyvinyl chloride water-stop of the size and gauge shown on the drawings acceptably placed in the work. In computing the quantities, no allowance will be made for laps.

20.5 RATE AND PAYMENT

Payment will be made for the number of Lin.Ft./M. measured as provided above at the contract unit price per Ft/M. for Furnishing and installing polyvinyl chloride water-top and shall include full compensation for splicing materials, splicing, sealant and all other work related to the section.

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21.1 DESCRIPTION

Unless otherwise specified, the roofing and water proofing shall consist of:

a) For Flat Roofs

Providing laying grouting and pointing 1st class burnt brick tiles 9" x 4-1/2" x 1-1/2" in 1:3 cement sand grout over (3") 76 mm (average) thick puddle earth laid to slopes and consolidated. The earth will be laid over water proofing, consisting of sand blinded coat of bitumen over R.C.C. roof, covered over with the one (1) layer of polythene sheet .008" thick over 2 coats of bitumen.

b) For Sloped Roofs, Vaults and Shades

Providing, laying, grouting, and installing split tiles rough glazed of size indicated on the drawings, over 3/8" thick special Dry Bond Mortar over 1/2" thick Cement Sand base plaster (1:4) over RCC slab.

Providing, laying & fixing in position Terracotta Khaprail tiles of approved required size laid with 3/4" thick cement sand mortar (1:2) bed over existing sika water proofing on R.C.C slab laid in slope, properly fixed, as per specifications and as directed by the Engineer. Unless otherwise specified, the flexible wear proofing coating Sika Seal 105 N shall be provided and applied over R.C.C roof slab after clearing the surface as per drawings and manufacture over R.C.C roof slab after clearing the surface as per drawings and manufacturer specifications.

c) Over Drains

- 2 coats of VANDEX SUPER @ 1 Kg/meter square of approved equivalent over drains on sloped roof.

21.2 MATERIAL REQUIREMENT**21.2.1 Brick Tiles**

Brick tiles shall conform to specifications of materials given in respective items of "Section-I Materials".

21.2.2 Split Tiles and Special Dry Bond Mortar

Split Tiles and Special Dry Bond Mortar shall conform to specifications given in the relevant Section and as shown on the drawings.

21.2.3 Terracota Khaprail tiles

The Terracotta Khaprail tiles shall conform to specifications given in the relevant section and as shown in the drawings.

21.2.4 Mud Mortar

Puddled earth shall be composed of stiff clay to which an equal bulk of chopped rice husk / bhoosa shall be added.

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21.2.5 Thermopore Sheet

Thermopore shall be of the type used for insulated roof and shall confirm to specifications given under item 1.19 in Section-I "Materials".

21.2.6 Vandex Super

Vandex Super or approved Equivalent to be used for water proofing and protection of concrete.

21.3 CONSTRUCTION REQUIREMENTS**21.3.1 Over Flat Roof**

- a] One Prime coat and two flood coat of SIB 10/20 hot bitumen at the rate of 7 kg. per 100 Sq. Ft. each coat over RCC slab.
- b] Apply one layer of polythene sheet (500) gauge, laid 3" side laps and 4" end laps staggered with layers bonded together with bitumen, broom sheet to ensure that it is free of wrinkles.
- c] Earth shall be laid to desired slopes and tiles shall be laid on a mortar bed (average thickness 1") to the required slopes as shown on plans. The preparation of mud plaster shall be as follows:

The clay containing sand not more than 5% shall be laid out in stakes not exceeding 12" height and saturated with water and allowed to stand for not less than 3 days, water being added during this period to ensure complete saturation. The binding material (Bhoosa) shall then be added and the mixture will puddle and left for 2 days or so. It will then be thoroughly mixed to the required consistency of mortar and laid to slope.

- d] Brick tiles of specified size and first class quality shall be laid wet, grouted and pointed flush in cement sand mortar (1:3). The top surface shall be smooth and accurately level in accordance with the specified slopes. No brick or cracked tile to be used. Special Tiles for sloped roof shall be laid as per details shown on the drawings.

21.3.2 Sloped Roof, Vaults and Shades

- a] Split tiles rough glazed of size 9-1/2" x 2-1/4" x 3/8" shall be laid in position over 3/8" thick special Dry bond mortar over 1/2" cement sand plaster (1:3) over RCC roof slab, vaults, shades. The tiles shall be grouted and flush pointed with special Dry Bond Mortar.
- b] Terracotta Khaprail tiles size 9" x 5 1/2" x 3" including 1" thick collar, or of approved required size, and of superior quality shall be laid and grouted in cement sand mortar (1:2) or as specified in drawings.

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SECTION – 21: ROOFING & WATER PROOFING

The tiles shall be laid on R.C.C. roof slab over existing sika water proofing, in accordance with the specified slopes. No cracked tile is to be used.

c] On drains near vaults, shades etc. 2 coats of Vandex Super over RCC slab.

21.3.3 Working Instructions of Applying of Vandex Super or Approved Equivalent

Vandex Super or approved Equivalent in powder form shall be distributed over the concrete surface by means of a sieve with a sieve size of 2 mm just prior to trowelling the slab. The Vandex or approved Equivalent layer and the newly Cast Concrete shall be protected according to general description for concrete work. The Contractor shall co-ordinate the application of Vandex Super or approved Equivalent at the time of pouring and trowelling slabs.

21.3.5 CURING

Tiles, after laying, grouting and flush pointing is completed, shall be kept wet throughout for at least seven days.

21.3.6 PROTECTION

The Contractor shall take each and every care to maintain the slopes levels and shall protect the work from any damage. The Contractor shall have to remove, replace and rectify such damaged work at his own cost.

21.3.7 MEASUREMENT

The measurement under this item of specifications shall be made in Sq. Ft.M of the actual surfaces completed and approved.

21.3.8 RATE AND PAYMENT

The payment shall be made at the respective unit rate as entered in the Bill of Quantities and shall constitute full compensation for all materials, equipment, labour including all incidentals, i.e. flashing etc. necessary to complete the work.

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22.1 SOFT LANDSCAPING**22.1.1 Site Clearance and Fillings:**

- a. The site when handed over for the development of soft landscape the work to be done under this items consists of excavation of one feet present soil, as per Govt./Local Body Rules back filling with sweet earth river silt as approved by the Engineer.
- b. Clearing All areas which require clearing as determined by the Consultant shall be cleared of all trees bushes rubbish and other objectionable matter and such materials shall be removed from the site of work or other wise disposed off as approved by Consultant /Govt./Local Body Rules. Any damage to the works and public or private property caused by Contractor's operation shall be made good through repair or replacement at the sole expenses of contractor. The above be read in conjunction with the section of the clearance of site and layout of building and landscape.
- c. The required depth and dimensions and in accordance with the Drawings or as directed by the Consultant.
- d. The work shall be carried out in complete conformity with the specification set forth here under.
- e. Filling around pipes and cable shall be carefully placed, fine material to cover the pipe of cable completely before the normal filling is placed.
- f. Material for back filling shall be approved by the Consultant and shall conform to the requirement of specification.
- g. Shall be placed in layer of 6" and saturated with sufficient water or other wise compacted to produce not less than 95 in sin density with respect to maximum density at optimum moisture content achieved in test number 12 of B.S 1337- 1967.
- h. Filling shall not be placed against foundation walls prior to approval by the Engineer Filling shall be brought up evenly on such side of walls as far as practicable.
- i. Heavy equipment for spreading and compacting the filling shall not be operated closer to filling above the top of footing.

22.1.2 Setting Out

Lines and levels will be set out by the contractor who shall be responsible for maintaining all stakes and witness set up by the Landscape Consultant for the work in strict accordance with them.

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22.1.3 Stakes & Guys.

Stakes for tree spurs to be free sound rough swan wood free from knots, rots, cross grain or other defects that would compare these strength. Stakes are to be of minimum diameter of 50 mm and be of minimum length 2.5 m with pointed end. For tying, raffia or split date fibre or any other soft material should be used. Between plant and the stake a small piece of old cycle tyre should be loosely wrapped around the tree stem to avoid injury to the stem. Never use strung or wire which may cut the bark.

22.1.4 Plant Material

Nomenclature of all plant materials used shall be confirmed and any doubt regarding the recognition of any species be referred for clarification. The Botanical Local Name are given in 22.4-1 to 22.4 under PLANTATION SCHEDULE.

22.1.5 Plant Schedule

Schedule of plants, quantity, sizes and other requirements are given in BOQ. However plants be arranged as per drawings and prior approval of the Engineer.

22.1.6 Quality of Plants

All plants should be typical of their variety and should have normal well developed branches and vigorous roots system. These should be sound healthy free from defects, disfiguring knots, abrasion of barks, sun scaled injuries, plants disease, insects, egg borers and all forms of infection.

22.1.7 Measurements

A plant shall be dimensioned as it stands in its natural position. Large plants cut to specify sizes shall not be accepted. The size of plants specified in the bill of quantities should be strictly followed.

22.1.8 Inspection

No plant material shall be planted by the contractor unit it is inspected and approved by the engineer. All rejected material shall be immediately removed from the site and replaced with acceptable material at no additional cost.

22.1.9 Digging, Wrapping & Handling:

a) **Balling Plants:** These plants should be dug and prepared in a manner that will not cause any damage to the branches, shape and future development of plants after replanting.

b) **Balled Plants:** these plants should be adequately balled with the firm natural ball of soil. No such plants should be accepted if the ball is cracked or broken or if the stem is loose in ball before or during the process of planting. The should be lifted from the bottom of the ball.

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22.1.10 Protection against Drying Out:

All plants should be handled so that roots are adequately protected at all times from drying out and from other on injuries. If the balled plants cannot be planted immediately upon delivery the plants should be well protected with soil. All plants stored at site are to be watered as required to ensure no harm suffered by the plants during the period.

22.1.11 Plant Material Labels:

For correct identifications and for inspection purposes all plants material should have durable and legible labels using weather resigning ink stating the correct plant names and sizes.

22.1.12 Substitution:

Plants other than those specified in schedule shall not be accepted or used unless specifically approved in writing by the Consultant.

22.1.13 Transport:

When transported by trucks, all plant material should be backed to provide protection against climate breakage⁴ and injuries during transit. The top shall be securely covered with canvas. To minim use wind whipping and drying. Under no circumstances, the balled plants shall be dropped from the truck to ground.

22.1.14 Time of Planting:

Planting should be done under favorable, weather conditions, during the approved planting season, at all contractors options and full responsibility.

22.1.15 Lay Out:

Exact location must be verified on ground. Prior to excavation of planting pits, the contractor shall ascertain the location of all utility lines electric cables sprinkling system etc.

22.1.16 Excavation for Planting:

No planting hole should be dug, until the proposed locations have been approved by the Consultant. Pits should be circular in line and shall have vertical sides and flat bottom.

22.1.17 Preparation of Planting Beds/Pits:

Prepared soil mixtures should be spread uniformly in the pit. Bed shall be brought to a smooth and even surface conforming to established grades after full settlement has occurred, soil in the bed shall be moist at the time of planting. The details instruction given in clause for preparation of site plantation be adhere to.

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22.1.18 Adjusting and Cleaning:

Excess and waste material shall be removed daily when planting in the area has been completed the area should be cleared of all debris, spoiled pit containers and as per PHA Rules. All site should be left in clean and tidy condition.

22.1.19 Setting Plants:

Plants should set in pits at such level that after settlement the plant will bear the same relation to the finish grade of the surrounding ground. Trees should be set plumb and rigidly braced in position until the soil has been tamped solidly around the ball or roots. The plants should be planted in approved top soil in a prepared soil mixture which should be thoroughly settled by watering and tamping.

22.1.20 Back Filling of Planting Pits and Planting Beds:

Prepared planting mixture should be filled in the pits carefully to fill all voids and to avoid breaking roots. When pits are nearly filled, water thoroughly and allow water to soak away. If setting of back fill occurs, at more back fill to bring it to the level. The details Instruction given in clause for preparation of site plantation be adhere to.

22.1.21 Top Soil:

Should be arranged from off site and should be obtainable from natural well drained areas. Removal should not be from an area in which existing plant material as noted by visual inspection, appears unhealthy or dead. It should be natural, fertile and uniform in composition. It should be clean and free of rocks lumps clods and excessive roots and vegetation. Top soil from each location should be analyzed by recognized laboratory and reports furnished to the engineer prior to delivery. Top soil should contain less than 5% gravel not passing through a 2mm screen. The top soil having passed through the screen should comply with the following.

- a. **Sand component:** Soil particles 2.0 to 0.05 mm diameter shall be comprises 75% of the top soil.
- b. **Silt component:** Soil particles 0.05 to 0.02 mm diameter shall comprise 10% to 15% of the top soil.
- c. **Clay component:** Soil particles smaller than .002 mm diameter shall comprise 5% to 10% of the top soil.

22.1.22 Stakes:

The stakes of any kind will be provided by the contractor as the overall security is the responsibility of the contractor.

22.1.23 Pruning:

This should be limited, to the removing of injured trunk and branches and not to exceed one half of the branching structure.

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22.1.24 Maintenance:

Plants should be kept in healthy growing conditions by water, pruning, weeding and fertilizing.

22.1.25 Watering:

Each plant should be thoroughly watered

- a. Tree & gall tree / day.
- b. Shrubs 5 gal / shrub / day.
- c. Ph. Value 6.5 to 8.
- d. Note: In case sprinkler system is enforced then irrigation will be carried out with this system.

22.1.26 Inspection:

- a. Initial Inspection: Upon completion of planting as specified in the documents, the engineer will inspect the installed plants and material at this time all dead and unsatisfactory plants will be identified.
- b. Replacement and Re-inspection: The Consultant will re inspect the replacement materials. Any plant failing the inspection will be replaced and will be re-inspected as required.

22.1.27 Maintenance Period:

The contractor shall be responsible for maintaining the plants for one year, from the date he has finished the planting on site. During this period the contractor is responsible for all operation necessary to achieve healthy growth of plants installed. This will including watering, fertilizing, spraying, weeding, cultivation, pruning tightening of stakes and wires, replacement of any dead or unhealthy plant and resetting of any plant to upright position or to proper grade.

22.1.28 Security:

The contract is also responsible for the security of plants for the same period one year. He will employ One Watch man for night day for high duty and 3 Gardeners for the security and up keeping of plantation. Ensure protection of the plants from stray animals.

22.1.29 Final Inspection & Replacement:

Approximately thirty days prior to end of maintenance period, the Consultant will inspect all installed plants, for dead of unacceptable plants, stakes wires.

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a. Final Acceptance

Upon completion of all the replacement and repairs as identified during final inspection, the Consultant will issue a written notice of final acceptance of all planting works including or irrigation installation.

b. Maintenance instructions

From 60 to 90 days prior to end of the contracts maintenance period, 5 copies of written instruction for the year maintenance and care for installed plants and irrigation system shall be furnished to the Consultant. He contractor may submit an alternative system for security and irrigation with his tender.

22.2 PREPARATION OF SITE FOR PLANTATION**22.2.1 GARDEN MATERIALS**

- a. For planting of trees, a circular pit, 3feet deep 3 feet in diameter, and for shrub 2.5 feet deep and 2.5 feet diameter should be dug.
- b. Cavity of this pit will be left as it for 7 days, so that sun rays can pass through it.
- c. To avoid KALLAR at any stage, One Kg Gypsum powder will be placed in each pit well mixed.
- d. Filling of pit with water so that chemicals should become soluble and absorbed in the soil.
- e. Refill the pit with the mixture of soil taken out decayed leaf – mould well rotten cow manure and coarse river sand in the approximately sex heaped filled basket of soil one brimful basket of the cow manure and leaf mould and a quarter of a basket of sand well mixed together

OR

- f. Filling of the pit with river silt and cow dung, 2:1 ratio.
- g. Fill the pit with said mixture a few inches above the ground level to allow sink age.
- h. When pit has been filled water it copiously or twice to enable the soil to settle down.
- i. When soil reasonably dry, make a hole large enough to receive the ball of earth the root of the sapling to be planted.

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- j. When soil reasonably dry, make a hole large enough to receive the ball of earth the root of the sapling to be planted.
- k. While planting a tree it should be carefully watched tap root is straight in the hole and that plant collar is level with the top of the pit. Fill in the hole when the sapling has been placed in it, taking care that soil round the plant is firm.
- l. Always plant a sapling on a cloudy day or in the evening. The tree may be safely planted after the first shower of rain say in beginning of August or in the month of February after the danger of frost is normally over.
- m. During the early stage of tree's growth a stout stake should be provided. It helps to develop a straight stem and also prevents the young trees from being damaged by violent winds. For tying raffia or split date fibre or any other soft material should be used. Between plant and the stake a small piece of old cycle tyre should be loosely wrapped around the tree stem to avoid injury to the stem. Never use string of wire which may cut the bark.

22.2.2 Preparation for Flower Beds

The proposed flower beds will be dug 1.5 feet deep and soil will be removed from the site. Back filling mixture containing a part of each of the followings.

One Part River Silt Sweet Earth.
One Part Leaf Mould,
One Part Drain Silt (Gutter Ki Matti)

22.2.3 Preparation for Lawns

The Lawn will be prepared as per following sequences:

- a. Removal of all construction debris.
- b. Deep ploughing and removal of weeds roots.
- c. Gypsum Powder the scale of 5 Kg per 100 Sft area, will be well mixed in the top soil and followed by irrigation.
- d. Spreading of river silt or sweet earth in layer of 6" inches and proper compaction.
- e. Top 6" inches soil should have 3" Cow Dung (Farm Yard Manure) Spread and well mixed with the top soil.
- f. Preparation of pits for trees. Shrubs and flower beds as per specification given above. These will be marked on ground and approval of the consultant will be obtained.

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- g. The Sulphur Powder will be Spread at the scale of 1.25 Kg per 100 ft. will be well mixed in the top soil and followed by irrigation.
- h. Fixation of Rocks without motor.
- i. Leave lawn for 10 days and allow the weed to come out.
- j. Remove the weed.
- k. Spread DAP Fertilizer at the scale of 2.5 K.g per 100 Sft. Mix Well in the soil and irrigate it.
- l. Development of Sprinkler System.
- m. Plantation of all categories.
- n. Turf the grass.
- o. Weed Plucking.
- p. After second mowing Top dressing.
- q. Spread Urea Fertilizer at the scale of 2.5 K.g per 100 Sft. Mix well in the soil and irrigate it.

22.3.1 GARDEN MATERIALS

Following Garden material will be used, for the development of the landscape.

- a. River Silt or Sweet Earth The river silt is ideal for plantation point of view. Which is Pink in color? The source recommended is from RAVI RIVER. A sample will be provided by contractor. This sample will be tested and after the approval of the Consultant will be used. Approximately 100,000 cft. River Silt is required for entire project.
- b. Manures[(Farmyard Manure)(Gobber)]. The Farmyard manure not only directly add to the soil constituents needed for healthy life of plants. The tree elements "NITROGEN" "PHOSPHATES" and "POTASH" contain by this manure. The best source are Dairy Farm. The black color manure is acceptable. The golden color reduces its fertility, Approximately 33,000 cft. Will be required for the entire Park. Farm Yard Manure: this could be procured from nearby village. Prior to delivery its sample should be approved by the CONSULTANT.
- c. Leaf Mould (Patton Ki Khad) Well composed dark in color leaf Mould is required. It can be procured from PHA, Aitchison College or local Nurseries. One Thousand cft. Approximately required for the entire project.
- d. Drain Silt (Gutter Ki Matti / Mori Matti). The Gutter ki Mitti is ideally for bedded plants. The requirement of Drain Silt is approximately is one Thousand CFT.

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- g. The Sulphur Powder will be Spread at the scale of 1.25 Kg per 100 ft. will be well mixed in the top soil and followed by irrigation.
- h. Fixation of Rocks without motor.
- i. Leave lawn for 10 days and allow the weed to come out.
- j. Remove the weed.
- k. Spread DAP Fertilizer at the scale of 2.5 K.g per 100 Sft. Mix. Well in the soil and irrigate it.
- l. Development of Sprinkler System.
- m. Plantation of all categories.
- n. Turf the grass.
- o. Weed Plucking.
- p. After second mowing Top dressing.
- q. Spread Urea Fertilizer at the scale of 2.5 K.g per 100 Sft. Mix well in the soil and irrigate it.

22.3.1 GARDEN MATERIALS

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- e. Rocks. The Boulders of Kala Chitta range are commonly used in modern landscape. It will be used in irregular beds prepared in various Lawn. The rocks will be fixed without motor. The Rocks are available in Fathe Jang District Attock. Two truck load is required for the Park.
- f. Gravels. The beautiful pebbles will be used as a decorative item in the park. Its ideal use is in water course, it not only gives visual pleasure but also chythmic touch as water pass over it. It can be obtain from Attock near Mansar Camp One truck will be sufficient for entire Park.

22.3.2 OTHER DECORATIVE ITEMS

Following decorative items have immense landscape value. It is plan to be introduce in the Landscape.

a. Japanese lights

A replica of light house type concrete decorative item, is aesthetically painted. It is called Lantern Light and is extensively use in the modern landscape. These are made of different shape and sizes. It will have decorative value no electric connection is required the contractor will be briefed and will be shown the photographs of the light. The design will also be given there sets of 4 lights each a total 12 Japanese's Lights will be required. Each set will have a,large two medium and a small size light.

b. Border Pages

In order give more attractive look to the irregular beds and protect from stepping in unintentionally. A border peg made of concrete. With wire guy of 12 gauges painted size 9" long 6" High and 3" thick is planned to be used in the Park its tendering unit will be running foot. The contractor will be briefed and source will be indicated.

c. Birds & Animal Figures

The figures of 4*Deer size 5* Swan size,3 tall s* Flaming size 4 tall 3* Tortoise size 2.5 tall and 5*Frogs 1" high made of concrete. With wire guy of 12 gauges painted in natural colors are planned to be placed in the park. He contractor will be briefed and source will be indicated.

22.3.3 Chemical & Fertilizer

It is used to supplement the nutrients which the plant can obtain from the soil in order to increase the crop yield without determiner to quality. It is out of place which type of Fertilizer is required. Based on experience following will be required.

a. Gypsum Power

To avoid KALLAR approximately Two Hundred Bags of Gypsum Powder weighing 50 Kg each. After lifting of debris and construction material the Gypsum Powder will be used as under.

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(1) In Lawns

It will be spread at the scale of 5 Kg per 100 sft area. Will be well mixed in the top soil and followed by irrigation.

(2) In Pits

When pits of trees and shrubs are dug as per specification i.e. for trees 3 feet deep and for Shrubs 2.5 deep. One Kg Gypsum powder will be placed in each pit well mixed and pit will be filled with water.

b. Sulphur Powder

To enrich the top soils of the Lawns the Sulphur Powder 25 Bags weighing 50 kg each will be required. It will be spread on top when filling of lawn with river silt and farmyard manure is completed. The powder will spread at the scale of 1.25 kg per 100 sft. Will be well mixed in the top soil and followed by irrigation.

c. DAP

One Hundred Bags DAP FERTILIZER WILL BE REQUIRED FOR THE Park. It will be spread in the Lawns at the scale of 2.5kg per 100 sft Mix well in the top soil of lawn and irrigation it. This action will be taken before turning of grass.

d. Urea

This fertilizer will be used when grass has been mowed cut twice. 100 bags of 50 kg weight will be required for the Park. It will be spread at the scale of 2.5 kg per 100 sft in the lawn Mix well and proper irrigation.

22.3.4 Pest Control and Termite Agro Proofing.

The insecticide spray and termite proofing of the Park will be carried out when entire plantation is completed. It will be undertaken as per following programmed

22.3.5 Insecticide Spray:

Quarterly after all phases of plantation is completed.

22.3.6 Termite Agro Proofing:

Yearly first time after insecticide 1st insecticide 1st spray. Then after one year.

22.4 Plantation Plan:22.4.1 Ornamental Trees:

- i. Alstonia scholaris (shaitan)
- ii. Araucaria heterophylla (Araucaria)

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- iii. Bauhinia alba (Kachnar)
- iv. B-qurpurea (Kachnar)
- v. Callistemon lanceolatus (Bottle Brush)
- vi. Cassia fistula (ammaltas)
- vii. Delonix regia (Gold Moor)
- viii. Diospyros peregrina (Gab)
- ix. F-benjamina (Chanmki Ficus)
- x. F>B(HAWII)
- xi. F.B (Star Light)
- xii. F.B (Sun Light)
- xiii. F.iyrata (Tambakoo pata)
- xiv. Grevillea robusta (Shah Balut/Silk oad/Silvre Oak)
- xv. Jacranda mimosaefolia (Gul-e-Naleem)
- xvi. Magnolia grandiflir (Magnolia)
- xvii. Prnus roxburghii (Chir/Pine)
- xviii. Plumeria obstusta (Gul-e-Cheen)
- xix. Putranjiva roxburghii (Putajan)
- xx. Ravenala madagascariensis (Trveling Plam/Fan Palm)
- xxi. Saraca indica (Ashoka Tree)

22.4.2 Fruit Trees:

- xxii. Carica papaya (Papita)
- xxiii. Eriobotrya japonica (Lokat)
- xxiv. Citur (Kine Malta, Mussemser, Fuuter & Lemon)
- xxv. Plumb
- xxvi. Nephelium litchi (Litchi)
- xxvii. Tamarindus indica (Immi)

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22.4.3 SHRUBS:

- xxviii. *Acalypha wilkesiana* (Yellow Khalifa)
- xxix. *Acalypha tricolor* (Red Khalifa)
- xxx. *Aralia balfourii*.
- xxxi. *Ainia allughas*.
- xxxii. *Aphelandra squarrosa* dania (Cinchizia)
- xxxiii. *Asparagus falcatus*.
- xxxiv. *Artabotrys odoratissimus*.
- xxxv. *Brunfelsia calycina* Eximia (Yesterday, Today, & Tomorrow).
- xxxvi. *Buddleia asiatica*.
- xxxvii. *Cassia corymbosa*.
- xxxviii. *Cestrum diurnum*.
- xxxix. *Cestrum nana*.
- xl. *Cestrum aurantiacum*. (Peeli Raat ki Rani).
- xli. *Duranta repens* (Safais).
- xlii. *Duranta* (Yellow).
- xliii. *Duranta* (Yellow Double).
- xliv. *Duranta* (white Double).
- xl. *Euonymus japonicus*.
- xlvi. *Euphorbia corollata* (Lal Jhar)
- xlvi. *Euphorbia pulcherrima*.
- xlvi. *Excoecaria bicolor*.
- xlix. *Hamelia patens*.
- li. *Hamelia solanifolia*.
- li. *Hibiscus mutabilis*.
- lii. *Hibiscus rosa sinensis*.

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- lii. Hibiscus variegated.
- liv. Hydreicum Chinese.
- lv. Ixora coccinea.
- lvi. Jasminum grandiflora
- lvii. Jasminum samba
- lviii. Jasminum humile
- lix. Jasminum (Jhoi)
- lx. Jatropha multifida.
- lxi. Juniperus prostrate.
- lxii. Lagerstroemia lancasteri.
- lxiii. Lagerstroemia indica, Li elba, Li rosea.
- lxiv. Lantana alba L. camara L. coccinea.
- lxv. Ligustrum lucidum
- lxvi. Manihot esculenta.
- lxvii. Murraya exotica (murwa)
- lxviii. Nandina domestica (sacred Bamboo)
- lix. Nerium oleander (Pride of Ceylon Daner)
- lxx. Portulaca tobia (Green)
- lxxi. Portulaca Variegated.
- lxxii. Plumbago capensis.
- lxxiii. Punica granatum (Anar)
- lxxiv. Poinciana pulcherrima (Gold Moor)
- lxxv. Russelia juncea.
- lxxvi. Thevetia nerifolia.
- lxxvii. Thunbergia erecta.
- lxxviii. Tecoma stans.

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lxxix. Wood floribunda.

lxxx. (Silver Jhari)

22.4.4 CLIMBERS:

lxxxi. Allamanda aubletii.

lxxxii. Asparagus racemosus.

lxxxiii. Beaumontia grandiflora (Bomirilia)

lxxxiv. Clerodendrum Splendens (Magnifica) Scrlr Clerodendron.

lxxxv. Ficus pumila (trcey creeper IVE)

lxxxvi. Hedera helix.

lxxxvii. Hoya cornosa.

lxxxviii. Parthenocissus Quinquefolia (Syn. Ampelopsis) Virginia; creeper.

lxxxix. Passiflora cearulea. (Fasion Flora.)

xc. Pettea volubilis (PETREA Purpel Wreath)

xc. Pyrostegia venusta. (Golden Sower)

xcii. Quisqualis indica. (Jamka Bail Rangoon Bail)

xciii. Thunbergia alara.

xciv. Thunbergia grandiflora (Sky Flower)

xcv. Thunbergia laurifolia.

xcvi. Trachospermum jasminoides (Star Jasmine)

xcvii. Wisteria siensis (Wisteria)

22.4.5 DRACANAEA SERIES:

xcviii. D. marginata Tricolor.

xcix. D. marginata Bicolor.

c. D. Black.

ci. D. reflex Song of India.

cii. D. Fragrans.

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ciii. D.Drawf.

22.4.6 CORYLINE SERIES

civ. C.Teminalis Kiwi.

cv. C.Glauca (Black Dracinia)

22.4.7 HOUSE PLANTS

cvi. Aspidistra-elatior.

cvii. Xolima recurvata (Black Dracinia).

cviii. Schefflera arboricola compacta.

cix. Montera delicosao.

cx. Diffenbachia.

cxi. Codiaaeum (Croton).

cxii. Aglaonema.

cxiii. Philodendron's (P.Erubescens, P.Hastatum.

P.Burgundy, P.Pandurigorme & P. meancchrysum).

22.4.8 PALM SERIES

cxiv. Caryota urens (Drawf Fishtail Palm).

cxv. Chamaedora elegans (Americal Plam)

cxvi. Chrysalidocarpus.lutescen

cxvii. Phoenix cararienses (Canary Date Palam)

cxviii. Howea forsteriana (Kantia palm)

cxix. Cycas revoluter (Sago/kangi Palm)

cxx. Rhapis excelsa (Bait palm)

22.4.9 GROUND COVERS

cxi. Arocinia.

cxii. Xenthra.(Green, Variegated, Red Lahore. & Red Karachi Origin)

cxi. Sygonium.

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- cxxiv. Asparagus densiflorus sprengeri
- cxxv. Asparagus setaceus (A. plumosus)
- cxxvi. Kalanchoe.
- cxxvii. Chlorophytum.
- cxxviii. Chlorophytum.
- cxxix. Gerabera double.
- xxx. Tradescantia Fluminenses Variegated (Wandering Jews)
- xxxi. Coleus scalar pncho.
- xxxii. Ferns.
- xxxiii. Geranium.
- xxxiv. Begonia.

22.4.10 AQUATIC PLANTS

- xxxv. Water Lilies (Nympheaea).
- xxxvi. Marginal Plants. (Acorus calamus. Butomus umbellatus
- — Calla Palustris. Catha palustris)
- xxxvii. Oxygenators (Submerged Plants).
- xxxviii. Moisture – Loving Plants.

22.4.11 WINTER ANNUALS

Seedling of following Hybrid Seed are planned to be planted in the park. The contractor will get the seed inspected before plantation. He will provide grown up seedling in ready form for transplantation of following species:

- xxxix. Antirrhinum.
- cxi. Cineraria Grandiflora.
- cxli. Cineraria-Martina.
- cxlii. Dahlia.
- cxliii. Dianthus.
- cxliv. Marigold.

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- cxlv. Nasturtium.
- cxlvi. Pansy: Gaint Flowered.
- cxlvii. Petunia.
- cxlviii. Petunia.
- cxlix. Phlox.
- cl. Schizanth.
- cli. Statice.
- clii. Sweet William.
- cliii. Stock.
- cliv. Salvia.
- clv. Verbena.
- clvi. Viola.

22.4.12 BULBIOUS & TUBEROUS PLANTS

- clvii. Allium
- clviii. Amaryllis.
- clix. Anemone.
- clx. Freesia.
- clxi. Gladiolus.
- clxii. Iris.
- clxiii. LXia.
- clxiv. Narcissus and Daffodil.
- clxv. Ranunculus.

22.5.1 MAINTENANCE INSTRUCTION

22.5.1.1 General:

A laid out landscape is always be objects of beauty and give an immense sense of satisfaction; but they can also demanding, and there is always a fine line

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between one that is source of pleasure and one that becomes a worry or even burden. The lack of enthusiasm is rarely the problem. A dedicated effort is required to maintain a panorama. It takes years to develop an attractive scenery, when plants attain maturity and starts giving us pleasing display. But it takes few days to spoil well planned and developed garden by poor maintenance, lack of knowledge and causal approach. Hence the importance of maintenance has increased in many folds.

22.5.1.2 The green turf is the heart of any garden. The grass when well tended and trimmed, is perennially green and gives vivid and please patch of color, practically through out the year. The well kept lawn is beautiful - swirling l a rich carpet of green between beds and border, setting color of flowers perfection and utilitarian, providing an all compassing playing, lounging and walking place. It is wonder that most garden include a lawn of some king, and in many it is a major feature. The grasses grow almost every where are all the difference in the world between the arch of grass, and beautiful sword. It requires as much acre and attention as any other garden feature. In order to achieve better result the green turf requires good preparation of soil and post plantation care.

22.5.1.3 The concept of Landscape development and maintenance revolves around good soil and manure low maintenance plantation and back up with reliable irrigation system, skilled manpower and labour saving tools. Following cheek list to arrive at reasonable high standard of he maintenance.

22.5.1.4 After successfully completion of plantation phase, the most important stage of maintenance of newly planted sapling starts. Following actions are suggested to taken.

- a. Organize maintenance parties at least one party for ach Lawn
- b. Employment of additional staff such as supervisor one Gardener 10:
- c. Procurement of Maintenance Equipment.

22.5.1.5 Periodic Maintenance.

- a. Daily Irrigation.
- b. Weekly Weeding.
- c. Weekly dressing of pits.
- d. Weekly adjustment of stake.
- e. Replacement of dead plants on occurrence except on extreme temperature days.
- f. Quarterly spray of insecticide.

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- g. Agro-Termite treatment on yearly basis.
- h. Pruning of trees during dormant seasons.
- j. Pruning of trees during dormant seasons.
- k. Quarterly inspection by Specialist.

22.5.1.6 Maintenance Instruction. Following points must be adhere to:

- a. During early stage of tree's growth a stout stake should be provide. Which will help to develop a straight stem and also prevents the young trees from being damaged by violent winds.
- b. Cut away the lower branches of young tres as soon as they appear after the saplong are fully established and are in position to stand this shock. This will improve the shapes of trees. Is would however advocate the removal of all side branches of the fully established trees till the main stems or trunks have attained height 9-12 feet.
- c. A tree growing on single smooth and straight stem to its height will give pleasing look.
- d. It must be seen that no grass or other weed should be allowed to grow round then newly planted tree for a considerable period. Fork the soil round the tree to the radius of two feet occasionally.
- e. Violent winds, sometimes, break big branches of fully grow trees. If this happens the stubs of broken branches should be sawn smooth and insecticide should be applied theron or the end of the stub may be tarred or plastered with a paste of mud and vow dung.
- f. In cold and dry season, some trees are devoid of leaves and consequently absolutely barren and shade less but this nudity is amply compensated by productin of flowers and new leaves and once again the makedness of the trunks, stem and branches are hidden from view. Moreover, it is the trees and slub which, be shedding of their leaves and dead branches, enrich the soil the lay down a layer of humus.
- g. In autumn when fall season starts these leaves should dumped in a pit and prepare leaf mould.

22.5.2 Useful Hints:

Insect pest and blight can never be completely eliminated; breeze carries fungus spores nit he garden. The utmost we can do is to try to control the trouble be timely preventive and precautionary measures and be destructive methods. I will impress upon the reader the great value of preventive measures, which are far more effective than treatment by pesticide, once damage has been commenced.

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22.5.3 PREVENTIVE AND PRECAUTIONARY MEASURE:

A healthy plant is more or less immune from the attacks of blight. The best way of preventing the disease is to keep the plants in good condition by cultivating them properly. Benefit of good cultivation is that the chrysalides of many insects, which develop in the soil are thereby distributed and destroyed with the result and the pest do not reach maturity.

- a. All trees and shrubs should be kept free from mosses and lichens, which harbor pests, be spraying every now and then with cleansing washes.
- b. Suitable manure's should be supplied moderately when the plants are growing and are thus in a fit condition to receive food to their benefit.
- c. Excessive manure is always detrimental to plants and attracts different types of insects.
- d. Proper manuring helps to strengthen a plant and increases its resistance of disease.
- e. Dead wood on a plant is a source of infection so it harbors fungi. They must be Removed at ones whether noticed at should brunt or thrown away.
- f. Dead branches of trees and shrubs must be cut back to live wood.
- g. Withered leaves, which are infected by disease should be collected and brunt.
- h. Wound on trees on trees should be attended to at once, for they often let in fungus disease.
- i. Never leave dead plants to rot in the soil.

22.5.4 DESTRUCTIVE METHOD:

- a. It cannot be too strongly impressed that every effort should be made to detect the Presence of disease whether it due to insects, fungi or bacteria at earliest possible.
- b. Moment and to treat it immediately. Most diseases are easily controlled at the earlier stages which if allowed to run unchecked, they soon become uncontrollable.
- c. Once established fungi develop rapidly and in the later stages little can be remove them stop efforts should therefore be directed rather at prevention then cure. However if the fungus does become established the earliest possible opportunity. Should be taken of controlling it.
- d. When trees have been attacked by fungus in the previous season all dead wood should cut out in winter and burned care being taken always to cut back to healthy wood. In early spring the trees should be syringed with a fungicide projected on the twigs and branches in very fine spray once, twice are even three times at intervals of

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about three weeks. This will form a film that will prevent the establishment and germination of fungus spores blown at this season by the winds or carried by birds from effected trees.

- e. The fungus finds its way into the tissues of the wood and there passes the winter where no amount of spring can affect it, hence the necessity of spraying in early spring. Or summer a fungicide must be used in the same way as mentioned in clause above.
- f. To ensure that every particle of available food for insects shall be poisoned both side of the foliage and all part of branches and stems must be thoroughly covered with solution. This must be applied in a mist-like form from a sprayer with a very fine nose, so as to produce an even film over the leaves and twigs.
- g. The spray should be thorough as already expressed and should be carried out in the evening just before sunset at least in summer.
- h. Do not water or spray in direct sunlight in summer. The droplets on leaves become tiny lenses and scorch foliage, spray and watering, so far as is possible should be carried out in the evening in this weather.

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23.1 DESCRIPTION:

The work covered by this section of specifications of furnishing all labour, painting and polishing equipment, scaffolding, protective covering and materials, including that classified in particular as "Paint" hereinafter; and painting in performing as such, all plastered wall and ceiling surfaces, including soffits, sides of beams, etc. and the painting and polishing of all exposed interior metal work: miscellaneous and ornamental iron, steel and sheet metal and all wood work. The work under this section shall further conform to the requirements of British Standard Code of Practice CP:231:1966, "Painting of Building" and all the British Standards relied therein or bearing relevance.

23.2 General:

23.2.1 Where the work or term Paint and Polish is used or referred to 'as such' throughout the "Specifications, it shall be interpreted to mean and include the surface finish treatment consisting of any, all or some of the following items:

Sealers, primers, fillers, body and final coats, emulsions, varnish, shellac, or enamels, as, ore specifically defined hereinafter as to kind and quality and function for various surfaces and finishes.

23.2.2 All paint, polish and accessory material incorporated in or forming a part thereof shall be subject to the Approval and selection for colour, tint, finish etc. by the Engineer.

23.2.3 The determination of colour or tint of any particular surface, the depth of any colour or tint selected or required shall in on instance be a subject for an additional cost or charge.

23.2.4 Painting of wood, except if specified otherwise and for plaster surfaces shall be three (3) coat works in addition to the shop protection coats.

23.2.5 All paints shall be approved as manufactured locally and shall be brought on to the Site in sealed containers and used without any admixture or adulteration except where recommended in the Manufacture's printed instructions.

23.3 MATERIALS

23.3.1 The basic materials entering into the compounding and/or manufacture of all paints, varnishes, shellac and other finish treatments shall be of the best grade and quality of their respective kinds for the intended purposes. They shall be the products or formulas of recognized and reputable Manufactures of known reliability and integrity as approved.

23.3.2 All materials shall be delivered in their original unbroken containers or packages and bear the Manufacturer's name, label, and brand, and formula and be mixed and applied in accordance with his directions and/or instructions. The mixing of all paint or other covering finish treatments shall be done in the premises when required and as Approved.

23.3.3 Paints shall be well-ground, shall not settle badly, cake or thicken in the container, shall be readily broken up with a paddle to a smooth consistency and shall show easy

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brushing properties. The paint shall be suitable for spraying when thinned with not more than twelve (12) percent by volume of mineral spirits.

23.3.4 Paints shall be lime-proof where used on concrete blocks, concrete or plaster.

23.3.5 Unless specified or directed otherwise, plastic emulsion paint shall be DULUX or equivalent, oil-bound distemper shall be PAINTEX Vinyl Emulsion or equivalent, colour wash shall mean coloured chalk applied with gum at the rate of five (5) pound per bag of chalk; and snow cem shall be DUROCEM or equivalent. Synthetic enamel paint shall be SUPER GLOSS or Approved equivalent.

23.4 PROTECTIVE PAINTS

23.4.1 Unless otherwise specified all exterior and interior ferrous metal except reinforcing steel, bolts, rough hardware and metals with nonferrous coatings shall be given a shop coat of protective paint of Approved quality. Surface to be painted shall be thoroughly cleaned of scale, dirt and rust by the use of steel scrapers, wire brushes and blast or other equally suitable tools or methods. Oil and grease shall be removed with benzene or other suitable solvent. Paint shall be kept well stirred whilst it is being applied.

23.4.2 No paint shall be used after it has caked or hardened. Paint shall be well worked into all joints and corners; paint shall not be applied to damp surfaces nor when the temperature is below 40 degree F.

23.5 SAMPLE AND TEST

Sample of each type of paint and each colour proposed for use shall be submitted for Approval thereof before the material is used. Samples shall consist of one paint and three displays of each type and colour of paint applied to wood strips 2" by 6". Wood used for display stains, shall be the same kind as that on which the stain is ultimately to be applied. In addition to the submission of samples, the CONTRACTOR shall submit authenticated reports of tests of the materials proposed for use as may be required.

23.6 PREPARATION OF SURFACE AND APPLICATION OF PAINT

23.6.1 General:

Hardware, accessories, plates, lighting fixtures and similar items in place shall be removed prior to painting operations or shall be otherwise protected. All surfaces to be painted shall be clean, smooth, dry and free from dust, grit and other objectionable materials. All work shall be done in a workmanlike manner, leaving the finished surfaces free from drips, ridges, waves, laps and brush marks. Except if specified or required, cement water paints shall be applied under dry and dust free conditions and shall not be applied when the temperature is below 40 degree F nor when a temperature drop of 20 degree F or more is forecast. All primer and intermediate coats of paint shall be unscrapped and completely integral at the time of application of each succeeding coat. Each coat of paint shall have a slight variation of colour to distinguish it from the proceeding coat. Sufficient time shall be allowed between coats to ensure proper drying.

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Paints shall be thoroughly stirred and kept at a uniform consistency during the application and shall not be timed in excess of the printed directions of the Manufacturer. Paint containers shall not be opened until required for use. Paint shall preferably be applied by the spray/brush/roller or as directed. Floors, roofs and other adjacent work shall be properly protected by drop cloths or other coverings.

23.6.2 Concrete and Masonry:

Concrete and masonry surfaces to be painted shall be prepared by removing all dirt, dust, oil and grease for good adhesion.

The method of surface preparation may be left to the discretion of the CONTRACTOR, provided the results are satisfactory and acceptable as required.

Surfaces to be painted with cement water paint, shall be thoroughly dampened with a fine spray of water before application of the paint. The interval between coats of cement-water paint shall be not less than twenty four (24) hours, and the first coat of cement-water paint shall be slightly dampened before application of the second coat. The paint shall be applied with a stiff brush, and thoroughly worked into the surface to seal all pores, cracks and voids. The paint shall be cured by wetting the surface between coats, and at intervals for a period of not less than two (2) days after the application of the finish coat. Nails and similar exposed metal occurring in concrete or masonry surfaces shall be coated with shell or oil paint before the cement water paint is applied. Masonry surface to be painted with oil base paint shall be free from alkali and shall be thoroughly dry before paint is applied.

23.6.3 Metal Work:

Shop primed metal work shall be kept clean and free from corrosion following installation. Surfaces shall be retouched prior to finish painting, using the same type of paint as the priming coat.

23.6.4 Plaster Work:

Plaster shall be at least two (2) months old (or if allowed in writing and shall be thoroughly dry, clean, and free from grit, loose plaster, and surface irregularities before paint is applied. Cracks and holes shall be repaired with patching plaster such as plaster of Paris properly keyed to the existing plaster. All plaster surfaces shall be tested for the presence of Alkali, which if present, shall be removed with a solution of Zinc Sulphate mixed in the proportion of 2-1/2 to 3 pounds to a gallon of water. After drying, the precipitate shall be removed by brushing. Plaster patches shall be worked to match the appearance of the adjoining plaster.

23.6.5 Wood Work:

Small dry seasoned knots shall be thoroughly cleaned and scraped and shall be given a thin coat of orange shellac varnish before the priming coat is applied. Large, open, unseasoned knots and all beads or streaks of pitch shall be heated by a blowtorch and

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then scrapped off, or if the pitch is still soft. It shall be removed with mineral or denatured alcohol. Resulting voids, if any, shall be filled with putty. Nails shall be set. Painting shall proceed only when the wood is satisfactorily dry.

(1) Priming:

All mill work specified to be painted shall be primed on all sides in the shop before delivery to the job.

(2) Puttying and Glazing:

After the priming coat has been applied, nail holes, cracks, and other depressions shall be filled flush with putty, coloured to match the finish coat and sand papered smooth. Putty shall be dry before subsequent painting.

Glazing, rebates and bends in exterior glazed doors shall be given one coat of exterior primer before glazing. All exposed putty shall be painted. A minimum of two subsequent coats of paint shall be applied and the surface finished satisfactory as specified.

23.7 SCHEDULE OF PAINT FINISHES

23.7.1 Chalk/Colour Wash:

Three coats of Approved quality shall be applied to all ceilings and other places as directed.

23.7.2 Distemper:

Three coats of Approved washable oil bound distemper shall be applied to internal wall or at locations as directed as per Manufacturer's instructions and direction. The distemper shall be of required shade and shall be the product of reputable of Manufacturer subject to the Approval.

23.7.3 Emulsion Paint to Plastered Surfaces:

Plastic Emulsion Paint or vinyl Emulsion Paint shall be used as indicated in the Bill of Quantities.

The plastered surfaces required to be painted with emulsion paint shall be painted with ready made Approved paint of the kind. The paint shall be applied in three coats strictly according to Manufacturer's instructions including preparing base coat. The paint may preferably be applied by spray or roller method of application unless permitted otherwise.

23.7.4 Enamel Paint to Plastered Surfaces/Wood Work/Steel Work:

The plastered surfaces required to be painted with enamel paint shall be painted with ready-made Approved paint of the kind. The paint shall be applied in three coats strictly

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according to Manufacturer's instructions including preparing 'base coat'. The painted surface shall finally exhibit a glossy finish as Approved. This will also apply to hard wood work or wherever required.

23.7.5 White Wash/Colour Wash

Concrete, concrete block and plaster shall be painted with three (3) coats of white/colour wash.

The lime should be slaked at Site with an excess of water to the consistency of pate/cream and should remain under water for forty eight (48) hours. The mixture shall then be strained through coarse cloth and gum water added (having 60 gramme gum to one (1) pint of water).

Colour washing shall be prepared as for white wash and colour added. The colouring matter is to be boiled and gum added to it and strained onto white wash.

23.7.6 Painting to Wood Work

Wood work required to be painted shall be painted with Approved oil paints as follows:

After surface preparation as specified apply one coat of wood primer.

After wood primer has thoroughly dried, apply three (3) coats of oil paint of Approved manufacturer directly from containers strictly according to the Manufacturer's instructions.

23.7.7 Painting on Metal Work

Except if specified otherwise metal work shall have, in addition to shop primer coats, one coat of enamel under-coat and one coat of semi gloss (dull) enamel, as well as two coats of anticorrosive red oxide pain.

23.7.8 Cement-Water Paint

Preparation of surfaces: Before the application of the cement water paint, all holes in joints or masonry surfaces shall be filled with mortar and suitably tooled. Caulking installed around wood or rietal frames built into masonry, shall be thoroughly checked. Masonry shall be clean and free from dust, dirt, grease or any other material which might affect the proper adhesion of paint.

Application of cement-water paint shall be mixed in accordance with the Manufacturer's directions and allowed to stand thirty (30) to forty five (45) minutes. Before application, the paint shall be mixed to uniform consistency and stirred frequently during application. The surface shall be uniformly dampened by spraying several minutes between coats for the moisture to penetrate. Paint shall be applied with a brush having relatively short, stiff, fiber bristles, scrubbing the paint into the surface voids. The first coat shall be cured by keeping the surface damp for at least twenty four (24) hours: the surface shall be sprayed as soon as the paint has hardened sufficiently to resist injury and the spraying

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repeated as often as necessary to keep the surface damp before applying the second coat. The second coat shall be applied in such a manner as to completely cover the first coat as specified above, except that curing shall be continued as long as practicable, and for not less than forty (40) hours. Paint shall be applied in shade rather than in bright sun light, especially during warm windy weather. In applying the finish coat an entire wall surface shall be completed in one operation. If this is impracticable, painting shall be carried out to some expedient stopping point.

23.7.9 Interior Painting:

Interior painting shall include the finishing of all ferrous metal work, wood work, concrete, concrete block, and plaster. Exposed pipes, pipe coverings, ducts, conduits, panel boxes, and other exposed ferrous metal work, for plumbing and electric work, shall be painted with wall or ceiling surface on or near which they occur, except where such surfaces are painted with resin emulsion paint, in which case the pipes, conduits, etc. shall be finished with three (3) coats of exterior oil paint. Pipe coverings, shall be sized with glue before being painted. Motors and other equipment for plumbing and electric work shall be painted as specified. Galvanized work shall be prepared in an Approved manner before being painted.

Interior wood work shall be finished as specified for exterior wood work except that the varnish shall be an interior varnish instead of a spar varnish. Wherever indicated on the Drawings, interior wood work shall be either painted or polished with sufficient coats of Approved paint or polish.

Concrete, concrete block and plaster shall be given three (3) coats of PAJNTEX Vinyl Emulsion distemper including primer coat, wherever indicated on the Drawings.

Concrete, concrete block and plaster shall be painted with one coat of primer and two coats (or as specified) of DULUX Paint including finishing coat wherever indicated on the Drawings.

23.7.10 Weather Shield Paint:

Weather shield paint shall be of ICI Deluxe or approved equivalent and shall be as per manufacturer's specifications. It shall be used on exposed surfaces wherever indicated on the drawings. It is a water thinkable emulsion, pigmented with light fast, alkali resistant non-lead, pigments and contains a mould control additive. It is suitable where alkali resistance and exterior durability are the prime requirements. It shall be applied by Brush, roller or conventional spray.

23.7.11 All Rounder Paint:

VIP all rounder interior super-matt paint shall be of Berger Robbialac or approved equivalent. It shall be applied by brush, roller or spray Thin where necessary with mineral turpentine. It is re-coat-able in 6-8 hours under normal conditions. All-rounder paint shall be applied to surfaces wherever indicated on the drawings.

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23.8 BURIED PIPING:

All steel piping and all exposed threads of galvanized piping, where run in or through concrete or masonry, or buried under, shall be given one (1) coat of Approved asphalt varnish where specified.

23.9 SAMPLES:

Prior to the start of the application of any paint and/or finish treatment otherwise, the CONTRACTOR shall apply samples of the required finish treatments to specific representative wall and ceiling surfaces or other areas or surfaces where indicated.

23.10 PROTECTION:

CONTRACTOR shall protect all the work against damage or injury by his employees, or by the materials tools or utensils used in connection with the work of this CONTRACT. Any and all work damaged as a result of the execution of this CONTRACT shall be repaired at the CONTRACTOR'S expense, or if it can not be properly repaired it shall be replaced with new work by the CONTRACTOR without additional compensation therefore beyond the CONTRACT amount. At all times, the general and liberal use of drop cloths shall be a primary requirement for protection purposes.

23.11 TOUCHING-UP:

At the completion of all Work specified herein all painted work shall be touched up and restored where damaged or defaced and the entire Work left free from blemishes.

23.12 CLEANING:

The CONTRACTOR shall clean all paint, spots, daubs, oil and stains, entirely from all floors, wood-work, glass, hardware, metal work and all similar items upon completion and level the work in perfectly clean condition in ever respect.

All cloth and cotton waste, which might constitute a fire hazard shall be place in metal containers or destroyed at the end of each work day. Upon completion of all work all staging, scaffolding, and containers shall be removed from the Site or destroyed in a satisfactory manner.

23.13 WAX POLISHING TEAK DOORS AND FRAMES:

Surfaces to be Wax Polished shall be rubbed down to a smooth surface filed as necessary, dusted off and rubbed over with miner oil well rubbed in with a circular motion. The surface afterwards being wiped dry. After an interval of at least 48 hours wax polish shall be applied in two coats and shall be polished to an approved finish.

23.14 MEASUREMENT:

The painting and finishing on all surfaces, other than timber and steel works which shall be deemed to be inclusive of painting and finishing in their own items of work, shall be

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SECTION – 23: PAINTING & POLISHING

measured and paid for at the unit rates entered in the Bill of Quantities, they shall be taken to have been already included in the rate of items to be finished and painted.

23.15 RATE & PAYMENT:

The payment shall be made at the unit rates as stated in the Bill of Quantities. Such payment shall constitute full compensation for all materials, equipment, labour scaffolding including all incidentals, necessary to complete the work.

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24.1 DESCRIPTION:

The work covered under this section consists of fabricating, supplying, fixing, and installing all cast-in place inserts including plates, bolts, nuts, all balustrades and handrails, steel gates all inserts and anchor bolts to be instead and/or grouted after the concrete or masonry work is executed and all miscellaneous metal work in connection with the installation of equipment, sanitary installations and mechanical plant that the contractor may be called upon to execute.

24.2 DRAWINGS CATALOGUE CLIPPINGS AND SCHEDULES:

The Contractor shall furnish complete shop drawings and manufactures, specification, where applicable, in respect of all work falling under this section for approval. Material fabricated or delivered to the site, before the approval of shop drawing shall be liable to be rejected. Shop drawings shall show in detail the method of construction, erection date, materials list and required connections. Schedules designating location quantity and finishing details of each item shall accompany every shop drawing.

The shop drawings schedules and manufacture's data, if any, submitted by the Contractor shall be modified or revised, as required. When revisions are required either to drawings, schedules or manufacture's data, they shall be resubmitted for approval.

24.3 CO-ORDINATION WITH OTHER TRADES:

All work under this section shall be coordinated with the work to be done as specified under other sections of the specifications.

The Contractor shall furnish all information and instructions required for work by other trades.

The Contractor shall drill, tap, cut and fit the work included herein as required, to accommodate work of other trades in conjunction with it.

24.4 SAMPLES:

Samples of all materials specified shall be submitted for approval.

24.5 MATERIALS**24.5.1 Steel Plates and Sections:**

Items involving steel plates and sections shall be made of mild steel conforming to the requirements of latest Pakistan Standards and/or B.S./ASTM 11 Standard Specifications.

24.5.2 Pipes:

If and where required pipes shall be full standard weight, of galvanized steel, mild steel or of cast iron and of sizes as indicated. Fittings, including clamps,

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shall be standard, malleable, galvanized and of the best kind manufactured on Pakistan.

24.6 GENERAL:

This section of the Specifications is intended to cover all miscellaneous items of various metals which are not specifically called for in other sections of these Specifications, item shown or called for on the drawings, but not itemized herein, shall be furnished under the Conditions of this section and shall generally conform, as closely as possible to these Specifications unless otherwise directed.

24.7 CONSTRUCTION REQUIREMENTS

24.7.1 Fabrication:

Metal shall be well formed to shape and size, with sharp line or angles. Shearing and punching shall leave clean, true lines and surfaces. Permanent connections shall be welded or riveted as shown on the drawings. The use of screws or bolts shall be avoided but where used, heads shall be counter sunk screwed on tight, and the threads nicked to prevent loosening. Curved work shall be evenly sprung. Casting shall be sound and free from warp, holes and defects that strength and appearance. Exposed surfaces shall have a smooth finish and sharp well defined lines.

Machined joints shall be milled to a close fit. Necessary rabbets, lugs and brackets shall be provided so that work can be assembled in a neat and substantial manner. Fastenings shall be concealed where practicable. Thickness of metal and details of assembly and supports shall give ample strength and stiffness. Joints exposed to weather shall be formed to exclude water. Holes and connections shall be delivered and fixed in position at the proper time. All the work shall be installed in an approved and rigid manner, and where possible, shall be secured with galvanized toggle or double Cinch type expansion bolts.

24.7.2 Installation:

All the item of work under this section of the Specifications shall be installed in accordance with manufacturer's drawings and directions to ensure proper and smooth operation of moving parts.

24.7.3 Painting:

All ferrous metal surfaces except working parts 1 machinery, galvanized surfaces and other surfaces not normally painted, shall receive one coat of rust 1 inhibitive metal primer to red lead paint and two coats of finish painting with paint for which no separate payment shall be made to the Contractor.

24.7.4 Protection:

All materials included herein shall be delivered to the site in satisfactory condition, and adequate precautions shall be taken to protect all material from damage and rust. Any

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portion that has been damaged will be rejected and shall be replaced with approved materials at contractor's cost. Installed material shall be protected from damage and rust until the works have been completed and handed over.

24.8 BUILT-IN-ITEMS:

All items of miscellaneous metal which are to be built into the structure of the building shall be furnished 1 as required during the progress of the work.

24.9 WELDING:

Welding shall be continuous along entire line of Contact, except where spot welding is indicated on the drawings or so authorized. Exposed welds shall be ground smooth except otherwise directed.

24.10 RIVETING:

Riveting where exposed, shall be flush unless otherwise indicated or directed.

24.11 BOLTING:

Bolting where permitted, shall be done with proper 1 sized bolt: Nuts shall be drawn tight and threads nicked.

24.12 STAIR CASE RAILING:

Unless otherwise Specified, the stair case railing shall comprise of 5/8" (16mm) square mild steel balustrades 2'-6" to 3'-0" (762 mm - 914 mm) high (clear above the steps). The balustrades shall be as indicated on the drawings and shall be anchored/embedded in the stair case concrete as shown. The top of each bar of balustrades shall be ground to a round shape to receive the M.S. flat. The M.S. flat shall then be continuously welded around the bar and the weld ground clean to a 45 degree centigrade angle fillet. It will be the contractor's responsibility to manufacture and install the balustrades so they are perfectly aligned and to finish the entire railing.

Ends of the M.S. flat shall be turned 90 and fixed to a 5" X 5" X 1/4" (127mm X 127mm X 6mm) M.S. plate embedded in the masonry or concrete wall as shown on the drawings.

The hand rail adjacent to the wall shall be anchored into masonry or concrete wall at 3'-0" c.c. (914mm) or as shown on the drawings.

24.13 MEASUREMENT:

All the items under this section of these specifications shall be measured paid for at their respective unit rates as entered on the Bill of Quantities and as shown on drawings.

- a] Stair Case railings shall be measured per Lin. Ft/M. complete and installed and acceptably completed and approved. On the longitudinal centre line along the

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finished hand rails upto the un-recessed face of the walls on which their ends are fixed.

- b] Other items covered under this section shall be measured under the head of the specific item in connection with which they are required to be executed.

24.14. RATE AND PAYMENT:

The unit rates shall be full compensation for all work described under this section inclusive of welding cutting and shaping to size, all paint materials and painting. No separate payment shall be made for false work, any unspecified work done in fabricating workshops or yards, or other erection expenses including all required brackets, bolts and units etc. as shown on the detailed drawings and as required for the complete installation of all railings etc.

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25.1 DESCRIPTION

Providing and fixing in position Superior quality PVC Doors of approved color with door frames, section, beading, arrangement, as per manufacturer specifications including, fittings, tower, bolts, handles, locks of approved quality, etc. complete in all respects as per drawings, specifications or as directed and conforming to the relevant B.S/ASTM specifications.

25.2 MATERIAL REQUIREMENTS

All the materials shall be of best grad and quality and shall comply with the specifications given in respective section. The material sections shall be according to ones shown in drawings and shall be free from any injurious matter.

These are elegant yet functional; these shall be made out of high-tech rust proof frames and, extruded PVC profiles. These doors shall be made as per the requirements as approved.

25.3 CONSTRUCTION REQUIREMENTS**25.3.1 Cutting & Forming**

All members shall be so cut and formed that they can be accurately assembled without being damaged or forced into position. The door lines may be carved with machine or molded with machine.

25.3.2 Size

Size and thickness of the door frame and the door leaf shall be according to the requirements as specified in the drawings and approved. The doors shall be single shutter doors.

25.3.3 Fittings, fixtures, etc.

All fitting & fixtures shall be of approved quality and shall be fixed as per standard practice or as per drawings.

25.3.4 Fixing

All the frames of doors and windows shall be fixed at site with the hold fasts of specified size and number and as shown on drawings with proper alignment and plumb.

25.3.5 Accessories

The P.V.C doors shall come with all accessories such as hinges, tower, installation bolts, handles, Mortise imported locks of approved quality, etc. complete in all respects as per drawing, specifications and instructions.

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25.3.6 Quality

All finished members must be free from twist, bends or ipen and shall strictly be in accordance with drawings.

The shall be waterproof, noise proof, Termite Proof, Fire Retardant, Economical, No Warping, Maintenance free easy to install, and available in various colors & shades.

25.4 PRECAUTION & PROTECTION

The Contractor shall take care to protect the work from any damage of whatsoever nature during Construction period. In case of any such damage done the work the Contractor shall remove replace or rectify such work at his own cost.

The doors shall open in Left or right directions, either inside or outside. Unless otherwise specified, all doors are internally beaded for maximum security. The gaskets are inserted and the beads are cut to size in the factory.

25.5 MEASUREMENT

The measurement shall be made in Sq.ft/M of the actual surfaces completed and approved.

25.6 RATE AND PAYMENT

The payment shall be made at he unit rates per Sq.Ft/M stated in the Bill of Quantities. Such payment shall constitute full compensation for all materials, equipment, labour including all incidentals, necessary to complete the work. The rate quoted shall deem to be inclusive of beading, arrangement, etc. No extra payment shall be made for such work.

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26.1 DESCRIPTION

The work covered in this section comprises of providing and laying in position best quality local made ceramic granite tiles of approved size and pattern including cutting, grinding, fixing, buffing, finishing, etc. wherever required or shown on the drawings or mentioned in the Bill of Quantities.

26.2 MATERIAL REQUIREMENTS

Except as otherwise specified, the British Standards and Code of Practice shall be applicable to materials, fixing methods and workmanship for ceramic granite tile work.

26.2.1 Joint Filling

Joint Filler shall be white Portland Cement grout with matching color pigment which shall bond to dry tile, shall be non-shrinking, stain resistant, permanent in color, and shall not inhibit fungus and bacterial growth. It shall be odorless and non-toxic, of smooth consistency for easy preparation and neat, rapid installation, and shall contain non-metallic material. Grout shall be water resistant and shall not wash out under water.

26.2.2 Adhesives

Adhesives for ceramic granite tiling if required are as specified in the standards or as manufactured by Shabbir Tile and Ceramic Limited or equivalent approved.

Tiles shall be laid with a floating coat of the proper execution of works; it shall be used as per instructions of the manufacturer and approved by the Engineer.

No extra cost shall be made in this respect.

26.2.3 Samples and Tests

The samples shall be furnished in sizes and colors and adequate in numbers for testing in and approved laboratory.

26.3 WORKING DRAWINGS

The Contractor shall prepare shall prepare working on the basis of working drawings for all the ceramic granite tile work to be carried out. These drawings will show clearly the sizes, method of fixing, jointing and the anchorage to be used in the process and the Contractor shall get approval in writing well in time before the actual start of work.

26.4 CONSTRUCTION REQUIREMENTS**a] In Cement Sand Mortar**

Surfaces to receive the ceramic granite tiling shall be free of dirt, dust, oil, grease or other objectionable matter. Setting beds and tile shall be installed with their respective surfaces to true planes, level or pitched to

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off-sets as required by the drawings, so that the surfaces of the completed tiling work will be at the elevations and grade shown. Re-tempering of the mortar will not be permitted. Tiles shall be laid out from the centre lines of each space outward and adjustments made along walls, partitions and borders, if any, so as to symmetries the pattern with a minimum of cut lines.

Joint between tiles shall be of uniform width and the same as the tile installed. Fractional changes in dimensions without varying the uniformity of the joint widths shall be permitted. Tile shall be cut with a suitable cutting tool and rough edges shall be rubbed smooth. Cut tile misfits shall be laid to the straight edges. Straight edges shall be accurately set to the lines established and reset at suitable intervals to keep the joints parallel over the entire area.

Over the existing bed, a topping of 1 1/2" thick P.C.C 1:2:4 shall be laid. Scratch coats for application as foundation coats shall not be less than 3/4" thick and shall be composed by volume of 1 part Grey Portland Cement to 2 parts of dry Sand, mixed with the minimum amount of water necessary to produce a workable mass. Mortar for scratch coats shall be used within one hour after mixing and re-tempering will not be permitted. Scratch coats shall be applied in sufficient quantity and with sufficient pressure to cover the entire area and to form good keys, shall be deeply scoured or scratched and cross-scratched, shall be protected and kept moist during the curing period. Scratch coats shall be thoroughly damp-cured, and an interval of not less than 24 nor more than 48 hours shall be permitted between application of scratch coats and application of scratch coats and application of float coats.

Float coats for shall be composed by volume of 1 part Grey Portland Cement to 2 parts of dry Sand, mixed with the minimum amount of water necessary to produce a workable mass. Float coats shall be applied in sufficient quantity and with sufficient pressure to cover the entire area and to form a good key, shall be brought out flush with the temporary screeds or guide strips so placed as to give a true even surface at the proper distance from the finish suitable for the reception of tiles.

Joints shall be straight, level perpendicular and of even width throughout. Vertical joints shall be maintained plumb for the entire height of the tile work. Each tile shall be brought to true level and plane by uniformly applied pressure under a straight edge or rubber faced block. Tiles that are out of true plane or misplaced shall be removed and reset. Damaged or defective tile shall be replaced. The tile shall be applied as follows:-

Wall tile shall be set by troweling a skim coat of neat Portland cement on the float coat of 1/2" thick cement sand mortar 1:2 as shown on drawing or by applying a skim coat to the back of each tile unit and immediately

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floating the tile into place. After tile has set, remove mortar using a minimum of water. Replace damaged tiles.

After the tiles have been thoroughly set, joints shall be grouted full with a plastic mix of neat, white cement immediately after a suitable area of tile has been set. The joints shall be struck flush and excess mortar shall be cut off and wiped from the mortar joints after grout has been cleaned from the surface. The surface shall be roughened at once and filled flush with the tile edge, before the mortar begins to harden. The skirting and covers shall be solidly backed with mortar.

b] In Thin Set Mortar

Tiles laid in thin set mortar shall be applied as per details shown on drawings and shall consist of a P.C.C base of specified thickness. Tiles shall be set by troweling a skin coat of Dry Bond Mortar on the base coat and combed with a notched edge of trowel. Back butter each tile unit to ensure 100% mortar coverage and float the tile into place, tapping the tile to ensure maximum bond strength. All other installation shall be as per specifications mentioned above.

26.5 MEASUREMENT

The measurement shall be made in Sq.ft/M of the actual surfaces completed and approved.

26.6 RATE AND PAYMENT

The payment shall be made at the unit rates per Sq.Ft/M stated in the Bill of Quantities.

Such payment shall constitute full compensation for all materials, equipment, labour including all incidentals, necessary to complete the work.

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27.1 DESCRIPTION

The work covered in this section comprises of providing and laying in position best quality local made ceramic granite tiles of approved size and pattern including cutting, grinding, fixing, buffing, finishing, etc. wherever required or shown on the drawings or mentioned in the Bill of Quantities.

27.2 MATERIAL REQUIREMENTS

Except as otherwise specified, the British Standards and Code of Practice shall be applicable to materials, fixing methods and workmanship for ceramic granite tile work.

27.2.1 Joint Filling

Joint Filler shall be white Portland Cement grout with matching color pigment which shall bond to dry tile, shall be non-shrinking, stain resistant, permanent in color, and shall not inhibit fungus and bacterial growth. It shall be odorless and non-toxic, of smooth consistency for easy preparation and neat, rapid installation, and shall contain non-metallic material. Grout shall be water resistant and shall not wash out under water.

27.2.2 Adhesives

Adhesives for ceramic granite tiling if required are as specified in the standards or as manufactured by Shabbir Tile and Ceramic Limited or equivalent approved.

Tiles shall be laid with a floating coat of the proper execution of works; it shall be used as per instructions of the manufacturer and approved by the Engineer.

No extra cost shall be made in this respect.

27.2.3 Samples and Tests

The samples shall be furnished in sizes and colors and adequate in numbers for testing in and approved laboratory.

27.3 WORKING DRAWINGS

The Contractor shall prepare shall prepare working on the basis of working drawings for all the ceramic granite tile work to be carried out. These drawings will show clearly the sizes, method of fixing, jointing and the anchorage to be used in the process and the Contractor shall get approval in writing well in time before the actual start of work.

27.4 CONSTRUCTION REQUIREMENTS

a) In Cement Sand Mortar

Surfaces to receive the ceramic granite tiling shall be free of dirt, dust, oil, grease or other objectionable matter. Setting beds and tile shall be

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installed with their respective surfaces to true planes, level or pitched to off-sets as required by the drawings, so that the surfaces of the completed tiling work will be at the elevations and grade shown. Re-tempering of the mortar will not be permitted. Tiles shall be laid out from the centre lines of each space outward and adjustments made along walls, partitions and borders, if any, so as to symmetries the pattern with a minimum of cut lines.

Joint between tiles shall be of uniform width and the same as the tile installed. Fractional changes in dimensions without varying the uniformity of the joint widths shall be permitted. Tile shall be cut with a suitable cutting tool and rough edges shall be rubbed smooth. Cut-tile misfits shall be laid to the straight edges. Straight edges shall be accurately set to the lines established and reset at suitable intervals to keep the joints parallel over the entire area.

Over the existing bed, a topping of 1 1/2 " thick P.C.C 1:2:4 shall be laid. Scratch coats for application as foundation coats shall not be less than 3/4" thick and shall be composed by volume of 1 part Grey Portland Cement to 2 parts of dry Sand, mixed with the minimum amount of water necessary to produce a workable mass. Mortar for scratch coats shall be used within one hour after mixing and re-tempering will not be permitted. Scratch coats shall be applied in sufficient quantity and with sufficient pressure to cover the entire area and to form good keys, shall be deeply scoured or scratched and cross-scratched, shall be protected and kept moist during the curing period. Scratch coats shall be thoroughly damp-cured, and an interval of not less than 24 nor more than 48 hours shall be permitted between application of scratch coats and application of scratch coats and application of float coats.

Float coats shall be composed by volume of 1 part Grey Portland Cement to 2 parts of dry Sand, mixed with the minimum amount of water necessary to produce a workable mass. Float coats shall be applied in sufficient quantity and with sufficient pressure to cover the entire area and to form a good key, shall be brought out flush with the temporary screeds or guide strips so placed as to give a true even surface at the proper distance from the finish suitable for the reception of tiles.

Joints shall be straight, level perpendicular and of even width throughout. Vertical joints shall be maintained plumb for the entire height of the tile work. Each tile shall be brought to true level and plane by uniformly applied pressure under a straight edge or rubber faced block. Tiles that are out of true plane or misplaced shall be removed and reset. Damaged or defective tile shall be replaced.

Wall tile shall be set by troweling a skim coat of neat Portland cement on the float coat of 1/2" thick cement sand mortar 1:2 as shown on drawing or

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by applying a skim coat to the back of each tile unit and immediately floating the tile into place. After tile has set, remove mortar using a minimum of water. Replace damaged tiles.

After the tiles have been thoroughly set, joints shall be grouted full with a plastic mix of neat, white cement immediately after a suitable area of tile has been set. The joints shall be struck flush and excess mortar shall be cut off and wiped from the mortar joints after grout has been cleaned from the surface. The surface shall be roughened at once and filled flush with the tile edge, before the mortar begins to harden. Tile skirting and covers shall be solidly backed with mortar.

Marble Goad of size $1\frac{1}{2}" \times \frac{3}{4}"$ or as approved shall be provided on top of the Dado or where specified, of approved color & shade and quality laid on $\frac{1}{2}"$ thick cement sand mortar 1:2 in corridors and any other place as shown on drawing including cutting and leveling as directed.

b] In Thin Set Mortar

Tiles laid in thin set mortar shall be applied as per details shown on drawings and shall consist of a P.C.C base of specified thickness. Tiles shall be set by troweling a skin coat of Dry Bond Mortar on the base coat and combed with a notched edge of trowel. Back butter each tile unit to ensure 100% mortar coverage and float the tile into place, tapping the tile to ensure maximum bond strength. All other installation shall be as per specifications mentioned above.

27.5

MEASUREMENT

The measurement shall be made in Sq.ft/M of the actual surfaces completed and approved.

27.6

RATE AND PAYMENT

The payment shall be made at the unit rates per Sq.ft/M stated in the Bill of Quantities.

Such payment shall constitute full compensation for all materials, equipment, labour including all incidentals, necessary to complete the work.

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28.1 Description

This item shall govern for the temporary dewatering of areas for the construction. Work in general shall include:

- A. Designing, furnishing, installing, testing, operating, monitoring and maintaining a system to control ground water and surface water as required to comply with the performance requirements specified.
- B. Controlling and removing seepage and surface water from the excavation, including excavation slope erosion control.
- C. Prevention of surface water from entering the trench and diverting the surface water away from the site.
- D. Removal of the temporary dewatering system after completion of the specified portion of work.
- E. Removal of ground water and surface water from all remaining excavation, after removal of the temporary dewatering system, until construction has reached finished grades.

28.2 Quality Assurance

The dewatering system work shall be performed by a firm which has at least five (5) years of successful experience in the field of dewatering.

The Contractor shall engage a qualified surveyor, to perform all layouts and measurements. The surveyor shall layout the work to the lines and grades required before installation and shall determine the location of each well point, piezometer and other data, as required.

The surveyor shall record and maintain all information pertinent to each well point and piezometer.

The temporary dewatering system as specified in these specifications shall be the minimum system required for controlling groundwater, regardless of source. The installed system shall be capable of lowering and maintaining the groundwater to at least 1-foot below the bottom of the excavation. Within these limits, the Contractor shall be responsible for the design of the entire temporary dewatering system and shall make whatever modifications and additions to the system as may be required for the system to fulfill its requirements.

28.3 Performance Requirements

The Contractor shall:

- A. Design, furnish, install, test, operate, monitor and maintain the minimum well point system, including all discharge piping and connections at point of discharge, sufficient to lower the ground water level or hydrostatic head below the bottom of the excavation, or lower, so as to prevent seepage of water into the excavation and permit construction "in the dry".

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- B. Design, furnish and install, test, operate, monitor and maintain whatever additional system that may be necessary to supplement the minimum wellpoint system and to maintain the excavation free of groundwater seepage and surface water, regardless of source.
- C. The periphery of the entire excavation shall be suitably diked and the dikes maintained to prevent surface water from entering the excavation.
- D. All water seeping, falling or running into the excavation as it is dug, and until the temporary dewatering system is removed as specified, shall be promptly pumped out.
- E. Dispose of all seepage and surface water removed from the project, regardless of source, by methods approved by the Engineer.
- F. Take appropriate and approved measures to prevent erosion of the excavated soils and ramp slopes.

28.4 Maintenance

The Contractor shall provide system maintenance including, but not limited to, at least daily supervision by someone skilled in the operation, maintenance, and replacement of system components and shall provide one (1) spare (connected) diesel powered pump; and all other equipment and work required by the Engineer to maintain the excavation in a dewatered and hydrostatically relieved condition. Dewatering and pressure relief shall be a continuous operation and interruptions due to power outages, or any other reason, shall not be permitted. A responsible operator capable of starting, finishing and maintaining the dewatering system and starting standby equipment shall be on duty at all times. Some responsible person shall continuously monitor the dewatering and surface water central systems, until the Contractor has received approval from the Engineer that he may discontinue surface and/or groundwater control.

28.5 Correction of Work

The Contractor shall be fully responsible for the failure of all components of the temporary dewatering work and for all damages to work in the excavation area caused by the failure to provide, maintain, and operate the temporary dewatering system. Contractor shall restore all damaged work, including failed components of the work in this specification to a condition as good as or better than existed prior to failure of components.

28.6 Job Conditions

The Contractor shall provide protection of persons and property by at least:

- A. Barricading open excavations occurring as part of this work and post with warning lights. Operate warning lights during the hours from dusk to dawn, each day. All barricades, signs and other types of devices shall be installed.

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SECTION - 28: DE-WATERING / UN-WATERING

- B. Protect structures, utilities, sidewalks, pavements and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by temporary dewatering system installation and operation.

The Contractor shall restore all streets, driveways, curbs, sidewalks and other existing items to a condition as good as or better than existed before work was commenced, at no additional cost.

- 28.7 If the site conditions permit and if approved by the Engineer, un-watering (open dewatering) may be permitted. The un-water shall be through system of open drains and collection sumps. The water will be disposed off by open pumping from the sumps to a suitable area. All costs for labor, materials and equipments will deem to be included in the rate.

28.8 Measurement

Dewatering/ unwatering systems shall be measured by the horizontal square foot of trench/ area being dewatered.

28.9 Payment

Payment shall be made at the contract unit price bid for Dewatering or Unwatering measured as outlined in the preceding section. Such payment shall be full compensation for all materials, equipment and labor necessary to furnish, install, operate and maintain the dewatering/ unwatering system, including any necessary traffic warning systems or any work necessary to restore the site to its original condition, including any damaged facilities.

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ELECTRICAL WORKS

Signature_____

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SECTION - 6: INTERNAL & EXTERNAL ELECTRIFICATION

6.1 SCOPE:

This section covers general requirements for furnishing, installation and testing of electrification works in consisting of:

— Internal electrification

External electrification

6.2 WORK BY THE CONTRACTOR:

The Contractor shall in detail, furnish/fabricate, assemble/install, test, paint and insulate (if specified) the following items in accordance with these specifications or as directed by the Engineer.

- Electrification works including internal and external lighting fixtures, bracket fans, exhaust fans, wiring, poles and power outlets as well as associated civil works.
- Cables and supports including all embedded parts and accessories.

The Contract includes the furnishing and installation of whole of the electrification work/equipment, which is described in or implied by these specifications. All matters omitted from the specifications, but may be inferred to be necessary for the efficiency, stability, completion and smooth operation of the works, shall be deemed to be included in the contract.

The Contractor shall, at all times, use his best endeavors to cooperate both on site and elsewhere with the Employer and all other persons concerned with the Project to the end so that the Project may reach timely and successfully completion.

6.3 REFERENCE STANDARDS

6.3.1 List of Standards:

Standards under which items of electrification works covered in this Section are to be furnished, failed or tested are specified in the test in abbreviated form (ASTM A36), where such standards are specified it shall be understood that the latest issue or revision in effect one month before the time of submission of tender shall apply. The numbers subjects of specified standards are given below for convenience.

ANSI C1	National Electrical Code
ANSI C7.4	Tinned soft or annealed copper wire for electrical purposes.
ASTM B33	Tinned soft or annealed copper wire for electrical purposes.

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SECTION – 6: INTERNAL & EXTERNAL ELECTRIFICATION

CIBS	Codes of practice
IEE	Regulations for electrical equipment of buildings
IEEE 80	Guide for Safety in AC substation grounding
NEMA WC-30	Colour coding of wires and cables
ASTM A36	Specification for structural steel
ASTM A525	Specification for general requirements for steel sheet zinc-coated (galvanized) by the hot-dip, process
BS 449	Use of cold formed steel sections in building
BS 5467	Armoured cables with thermosetting insulation for electricity supply
BS 6346	PVC-insulated cables for electricity supply
ICEA S-19	Rubber insulated wire and cable for the transmission and distribution of electrical energy
IEC-207	Aluminum stranded conductors
WAPDA Specifications P34:	Lattice steel poles

6.4 SUBMISSION BY CONTRACTOR:

6.4.1 General:

The Electrical works contractor shall submit construction programmes, progress reports, test reports and drawings as applicable to the work under this Section.

6.5 DRAWING AND DATA:

6.5.1 General:

The Contractor shall be responsible for the preparation of all working required to define the final fabrication and installation of all equipment furnished under these specifications. The Contractor shall submit the Engineer for approval shop drawings and schedules before work is fabricated and installed.

The Contractor shall prepare working schedules required for the installation of all items of electrification work furnished under this Section. The drawings shall show the exact method of installing and the components to be used in making all connections.

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6.5.2 Manufacturer's Data:

Manufacturer giving full information pertaining to the adequacy of the equipment, capacity, dimensions, materials and all other information shall be submitted to the Engineer for approval. Manufacturer's names of equipment, sizes, catalogue numbers and samples of materials shall be submitted as required by the Engineer for approval.

6.5.3 Shop Drawings:

The Contractor shall submit shop drawings. Submittals and shop drawings shall be complementary as far as possible so that drawings and submittals can be crosschecked.

6.5.4 Erection Drawings:

Where, in the opinion of the Engineer, erection of any part of the works could be hazardous or complex, the Engineer shall direct the Contractor to prepare and submit erection drawings for approval prior to commencing or continuing to erect that part of the works. The contractor shall prepare and submit these drawings at no extra cost to the Employer.

6.6 INTERNAL ELECTRIFICATION:

This section describes the installation of indoor electrification.

6.6.1 Supply:

The installations cover supply for normal and emergency lighting, 230 V single-phase, 400 V, 3-phase socket-outlets, bracket fans, exhaust fans, cables of appropriate sizes, etc.

6.6.2 Engineering:

The contractor shall undertake the complete installations including,

6.6.3 Main/Sub Distribution Panels:

The contractor shall furnish and install main/sub-distribution panels. Panels with MCCB and MCB's for normal lighting and socket outlets in the grid station, to be fed from the 400/320 V-mains.

6.6.4 Lighting:

6.6.5 Lighting Fittings:

6.6.6 SOCKET OUTLETS:

Socket outlets and power points shall be installed in all areas as follows:

Signature_____

Contractor M/S_____

Seal_____

6.6.6.1 Normal duty socket outlets:

Single phase 230 V, 10 A. All areas shall be reached with cable length of maximum 20 m.

6.6.6.2 Power outlets:

Single phase outlets 230 V, 20 A. All areas be reached with a cable length of maximum 10 m.

6.7 TECHNICAL REQUIREMENTS:

6.7.1 General:

The equipment and the installations shall be in accordance with IEC Standards and relevant Pakistan approve practice. All equipment shall be designed for used in a tropical climate:

6.7.2 Distribution Boards and Panels:

Distribution boards and panels shall be self-ventilated. No ventilating fans shall be used. Panels shall be designed for easy access to the equipment, cable terminals, etc. during maintenance.

Permissible temperature rises shall not be exceeded.

Each panel shall have at least 25 % spare installed capacity and furthermore 25 % spare space.

Bus bars shall be of copper and shall have three phases and a combined neutral bar and earthing bar.

Generally molded case circuit breakers (MCCB) and miniature circuit breakers (MCB's) shall be used. Use of ordinary fuses will not be permitted.

6.7.3 Lighting System:

An adequate indoor and outdoor lighting with illumination levels in accordance with recognized standards will be provided. Inside the control building, also, an emergency lighting system powered from the station battery must be installed; the system will operate instantly as the normal power supply fails.

AC lighting and power socket outlets, for 230 V, shall be single-phase, connected between phase neutral of the 400 V systems.

Fluorescent lighting, fittings are preferred everywhere indoor where it is feasible.

For outdoor lighting, waterproof lighting fixtures are recommended.

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SECTION - 6: INTERNAL & EXTERNAL ELECTRIFICATION

- > Lighting and power socket-outlets shall be for 230 V single-phase, connected between phase and neutral of the 400 V 3phase/4wire power system.
- > Loads shall, as far as possible, be evenly distributed between the phases.
- > In addition to the current-carrying conductors, and earthing conductor shall be run in each cable and circuit running from the distribution board to the equipment and appliances, which are to be earthed.

6.7.4 Lighting Installations:

Indoor lighting shall consist of normal lighting and emergency lighting. For the switchyard, outdoor areas, only normal lighting shall be installed.

During normal conditions both the emergency and normal lighting shall be lit.

These two systems shall be fed by separate circuits.

Normal lighting shall be supplied from distribution fixtures and exit luminaires shall be supplied from a distribution panel dedicated for this purpose. About ten-percent of all fixtures shall be emergency fixtures with minimum one such fixture in each room. The exit luminaires shall be installed above doors and corridors etc. the exit illumination shall have a sufficient distribution to ensure safe egress from the areas during a blackout.

All indoor lighting shall only be controlled by wall-mounted switches.

Emergency lighting shall only be controlled by switches mounted on the front of the emergency lighting distribution panel.

6.7.5 Illumination Levels:

The average illumination levels, as measured at a height of 0.8 m above floor, at any location, after approximately 100 – 150 operation hours, shall be as follows (minimum levels):

It is recommended that the normal lighting system should be designed according to the following design criteria.

Type of area	Illumination level	
Outdoor		
Areas with common staff traffic	100	lux
Roads and yard.	100	lux
Veranda	200	lux
Indoor		
Offices, control rooms, switch-gear rooms	400	lux

The illumination requirement for the emergency lighting shall be least 1 lux all over the related areas.

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SECTION - 6: INTERNAL & EXTERNAL ELECTRIFICATION

The lighting fittings shall be mounted in such a manner that the light, as far as possible, will be evenly distributed throughout the rooms or areas.

6.7.6. Wiring and Accessories:

For all installations insulated multi-core power cables shall be used for the wiring. Wiring shall be laid on or in the walls and ceilings. The wiring shall be installed in a neat and orderly manner. All cables shall be run either horizontally or vertically.

All installations shall be carried out in accordance with internationally accepted methods to a high standard of workmanship.

Cable and wire termination shall be performed without damage to the conductors; lugs shall be soldered or shrunk with approved tools. Lugs shall be used for all cables above 4 mm².

The following installation levels shall be used, referring to the height above the finished floor or finished ground (outdoor):

Lighting switches	1.30 m
Socket-outlets, offices, etc.	0.30 m

For outdoor lighting, poles of galvanized steel shall be provided. Each pole shall be delivered with steel bracket or a concrete foundation whatever the installation method require. Every pole shall be equipped with a junction box.

6.7.7. Local Earthing:

The Contractor shall be responsible for providing the earthing system require for the electrification works and co-ordinate this with the main earthing system.

6.8. EXTERNAL ELECTRIFICATION:

6.8.1. Lighting for External Area:

6.8.1.1. Introduction:

It describes the outdoor lighting installation fro the:

➤ External Area

The lighting installations cover luminaries, steel masts, and cables, foundations complete.

All fittings to be delivered with light sources.

6.8.1.2. Poles for the Lighting:

The Contractor shall furnish and install tubular steel poles 30 ft long for the lighting, generally in accordance with the requirements of Metal Work specifications

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6.8.1.3 Tools and Spare Parts:

1. Tool appliances and testing equipment as recommended by the Contractor for the proper operation and maintenance of the installation.
2. Spare parts equivalent to 5 % of the total quantity of delivered equipment.

6.9 TECHNICAL REQUIREMENTS:

6.9.1 General:

The equipment and the installations shall be in accordance with IEC Standards and relevant Pakistani National Standards. All equipment shall be designed for use in a tropical climate.

6.9.2 Lighting System:

Lighting shall be for 230 V single-phase, connected between phase and neutral of the 400 V, 3-phase/4wire power system.

Loads shall, as far as possible, be evenly distributed between the phases.

In addition to the current-carrying conductors, an earthing conductor shall be run in each cable and circuit running from the distribution board to the equipment and appliances, which are to be earthed.

6.9.3 Lighting Installations:

Outdoor lighting shall be, centralized as much as possible, and all lighting shall be controlled from a lighting control panel.

All light fixtures are waterproof.

6.9.4 Wiring and Accessories:

All installations shall be carried out in accordance with internationally accepted methods to a high standard of workmanship.

Cable and wire termination shall be performed without damage to the conductors; lugs shall be soldered or shrunk with approved tools. Lugs shall be used for all cables above 4mm².

6.9.5 Local Earthing:

The Contractor shall be responsible for providing the earthing system required for the electrification works and co-ordinate this with the main earthing system.

6.10 TESTING:

6.10.1 General:

Inspection and testing of all items of electrification work shall be in conformity with the applicable recognized standards for making such tests and inspections.

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SECTION – 6: INTERNAL & EXTERNAL ELECTRIFICATION

6.10.2 Electrical Equipment and Wiring:

All electrical equipment and wiring shall be tested in accordance with the applicable provisions of IEC or other approved Standard.

The test results and plans shall be submitted to the Engineer for approval.

6.10.3 Provision of Instruments and Labour:

The Electrical works contractor shall provide the supervision, labour, apparatus and instruments required to adjust and thoroughly test the installation, to his own satisfaction, to the satisfaction of Supply Authority and to the satisfaction of the Engineer.

6.10.4 Testing Upon Completion:

All tests shall be witnessed by the Engineer.

The Contractor shall apply for tests and inform the Engineer in writing at least four weeks in advance in order to make it possible for the Employer and the Engineer to be present.

When the Contractor has completed the installation, and has carried out tests to his own satisfaction he shall request Supply Authority to carry out acceptance tests. Upon acceptance by Supply Authority the Contractor shall complete and sign the current test certificate and submit it to the Engineer's representative will consider no testing until the above conditions have been met.

The following tests shall be carried out in the presence of the Engineer's representative.

- > Insulation tests between all phases, from each phase to neutral to earth.
- > Resistance tests on the earth continuity conductor and on any or all circuits as the Engineer's representative shall choose.
- > The resistance to earth of any or all earth electrodes, as the Engineer's representative shall choose, Ref BS-7176 and BS-7430.
- > The correct operation of controls, lights and other outlets;
- > Measurement of illumination level.

6.10.5 Repeat Tests:

No work will be accepted until the Engineer's representative is satisfied with the installation. The Contractor shall be responsible for all tests and re-test fees. The cost to the Engineer in witnessing repeat tests may be debited against the Contractor.

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7.1 CABLES:**7.1.1 General:**

This section covers the supply of medium voltage power cables and accessories, low voltage, control and communication cables and accessories.

All installations covered by this contract, specification for E & M.

The Contractor shall compute the quantities of cables, cable racks, etc. The 11 KV cable, the control and low voltage cables between the power station shall be laid on cable racks and the cable trenches.

The final cable routing and length will be determined during detailed design by the contractor under his responsibility.

7.2 REFERENCES:

The design, manufacturing and testing shall, comply with the below listed standards:

IEC	Safety Handbook containing all basic safety standards.
IEC 38	Standard Voltages.
IEC 59	Standard Current Ratings.
IEC 228	Conductors, solid or stranded plain copper.
IEC 287	Calculation of the continuous current rating of cables.
IEC 332	Tests on electric cables under fire conditions, Part 3: Tests on Bunched Wire or cables, Category C.
IEC 446	Colour codes.
IEC 502	Extruded solid dielectric insulated power cables for rated voltages from 1 kV up to 30 kV.
IEC 811	Common test methods for insulating and sheathing materials of electric cables.

7.3 EXTENT OF SUPPLY:**7.3.1 Power Cables and Accessories:****7.3.1.1 Medium Voltage Power Cables:**

- > MV Cable interconnection between MV Panel and 11 kV terminal poles LV.
- > AC 400/230 3Phase cable between generator terminals to auxiliary supply panels.

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- Any other CV/LV Cables required for complete functional installation.

The supply shall include connections to all A.C. powered equipment included in E & M Contract.

- All low-voltage A.C. power cables at the system.
- All low-voltage A.C. power cables at the intake.
- All 220 V.D.C. power supply and control cables.
- All telecommunication cables.

All cables shall be complete with terminal bushings, connection lugs and fixing equipment.

7.3.1.2 Instructions for Laying of Cables:

- Cables sizes are specified to accord with IEE Regulations (respect of voltage drop, but if for any reason the sizes are not given for a particular run the cable shall be of sufficient cross-sectional area to carry the full load without exceeding a voltage drop of 1 volt +2% of WAPDA'S declared voltage in the installation, except that in the case of motors running voltage drop at the motor terminals is 5% of the declared supply voltage.

In addition to the instructions for burial of cables in ground as given for 11KV cable, the following instructions will also be followed.

1. One end of the cable shall be terminated on respective switchboard and the other end shall be terminated at the respective connection point as indicated in the drawings but both ends shall have approved tags for ease of identification.
2. All cables shall terminate in suitable glands for securing the armour wires and incorporating a packing ring for exclusion of water and moisture. The cables will be secured at requisite spacing by means of cable cleats or hangers and where multiple runs occur, they shall be accommodated on heavy gauge galvanized perforated metal tray.
3. For all type of equipment, close attention shall be paid to the cable glanding and sealing arrangement. Cable entries as provided by the manufacture shall not be modified in any manner.
4. All mechanical cable glands shall be correctly matched to the cable concerned and shall be tightened to frame pressure tight seal between gland and bedding of the PVC insulated cables.
5. The cores of multi-core shall be colored in conformity with the BS Specifications in order to provide easy identification. Each cable core shall be seated solid and

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then continue to the terminals of the equipment. The cores shall be insulated by sufficient layers of empire tape for voltage.

6. Boxes shall be thoroughly clean and dry prior to filling with hot compound of the best quality best boxes shall be finally topped up to make up for any voids caused by shrinkage of the compound.

7.3.2 Control Cables:

The supply shall cover all interconnecting cables for control, protection, measuring, indication and telecommunication from the installations. The cable insulation shall be of a halogen free type.

7.3.3 Cable Accessories:

The supply shall cover:

Termination material, clamps, cable boxes and all necessary material for installation and erection of the cables.

7.3.4 Fire Protection Material:

1 (one) lot of fire-proof paint for painting all cables one meter on both side of any fire cell passage (block-out) and one meter for each 5 meter on the cable lengths.

1 (one) lot of material for fire proof barriers in all blackouts for cables in walls and floors.

7.4 TECHNICAL DESCRIPTION:

Cable are composed of:

- Conductors, solid or stranded plain copper conform to IEC standards.
- Conductor screen for medium voltage cables of extruded sheath or tape.
- Conductor insulation of PVC or XLPE identified by colour code according to applicable IEC standards, identification by colours.
- Black outer sheath of PVC for medium and low voltage cables.
- Gray outer sheath of PVC for control and measure cables.

7.4.1 Main Technical Characteristics:

The conductor cross section is calculated according to:

Rated current at temperature of 90 C for MV cables and 90 C or 70 C for LV cables.

Short circuit current at temperature of 250C for MV cables and 250 C or 180 C for LV cables.

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Maximum voltage drop of 5%.

Ambient temperature of 40 C.

7.4.2 Medium Voltage Cable:

Medium voltage cables of 50 mm² conform to IEC 502.

➤ Insulating material	PVC or XLPE
➤ Rated voltage	8.7/15 k V for 11kV cables
➤ Highest rated temperature	250 C
➤ Conductor	Copper
➤ Class	2
➤ Semi-conductor	Extruded compound
➤ Screen of cores	Copper type
➤ Assembly of cores	
- Inner covering and fillers.	Plastic
- Separation sheath	Polyvinyl Chloride
➤ Metallic layers for core cables	
➤ Armour	Steel
➤ Non metallic outer sheath	PVC
➤ Fire behavior	Flame retardant IEC 332

7.4.3 Low Voltage Cable:

Low voltage cables are insulation type with a minimum conductor cross section of 95 mm² for auxiliary power.

➤ Insulating material	PVC or XLP
➤ Rated voltage	600/1000 V Conductor Copper Class 1 or 2
➤ Number of cores	4
➤ Metallic armour	none
➤ Non metallic outer sheath	PVC
➤ Fire behaviour	Flame retardant

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7.4.4 Interconnection between Generator and Substation switchgear:

Cables are insulation type with a conductor cross section of 400 mm² or of appropriate size:

➤ Insulating material	PVC or XLPE
➤ Rated voltage	600/1000 V Conductor Copper Class 1 or 2
➤ Number of cores	1
➤ Non metallic outer sheath	PVC
➤ Fire behaviour	Flame retardant

7.4.5 Control Cable:

Control cables are insulation type multi-conductors with a minimum conductor cross-section of 4 mm² for command and control and conform to IEC standards.

➤ Insulating	PVC or XLPE
➤ Rated voltage	600/1000 V
➤ Conductor	Copper
➤ Class	1 or 2
➤ Number of cores	Multi cores
➤ Metallic armour	None
➤ Non metallic outer sheath	PVC
➤ Fire behaviour	Flame retardant

7.4.6 Metering and Protective Circuit Cables:

Metering and protective circuit cables are 600/1000 V insulation multi-conductors with a minimum conductor cross section of 6 mm² for voltage circuit and 6 mm² current circuit and conform to IEC standards.

➤ Insulating material	PVC or XLPE
➤ Rated voltage	600/1000 V
➤ Conductor	Copper
➤ Class	1 or 2
➤ Number of cores	4
➤ Metallic armour	none
➤ Non metallic outer sheath	PVC
➤ Fire Behaviour	Flame retardant

Signature _____

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Seal _____

7.4.7 Measuring Cables:

Measuring cables of 500 V insulation are multi pair type with a minimum cross section of 0.88 mm². The pairs are individually twisted and conform to IEC standard – PVC Insulated cables of rated voltage 450/750V.

➤ Insulating material	PVC
➤ Conductor	Copper
➤ Class	2 or 5
➤ Number of cores	4
➤ Shielding	Aluminum tape with spiral plastic.
➤ Metallic armour	none
➤ Non metallic outer sheath	PVC
➤ Fire Behaviour	Flame retardant

7.4.8 DC Cables:

D. C. cables between chargers and batteries and between batteries and distribution panels shall be single core type without metallic shield or armour.

7.4.8.1 Cable trays:

Scope of Supply:

This specification defines technical characteristics for the continual structure cable trays. The cable trays are the mechanical devices over which the cable between equipments, within the power stations are land. They include trays support, ladders and sectional irons.

7.4.9 TECHNICAL DESCRIPTION:

The cable trays consist of trays, ladder type or perforated plate type fitted on brackets. The bracket is themselves fixed to the vertical supports or hanging supports fixed to the main building structure, or they are directly fixed to the concrete walls.

The cable trays are said "simple" when one or more trays are fitted on one side only of their support or on the wall.

The cable trays are said "dual" when trays are fitted on both sides of their support.

The design of the trays is such that appropriate natural ventilation of the cables and their easy outlet through the trays lower part are ensured.

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The connection pieces used for the direction or level changes are calculated taking into account the cables radius or curvature.

The general structure of the cable trays has been designed to receive a cover for eventual mechanical protection.

The vertical cable trays consist of one or several cable rises, which are parallel on a vertical plan.

Each tray is made of pieces, fitted on the supports. These supports are directly gripped. The cable trays for measuring cables are made of plain or perforated sheet metal with folded flanges and fitted with a lid.

7.5.1 Surface Treatments:

The cable trays equipment is protected against corrosion by galvanization.

For the supports and brackets they are hot dip galvanized after manufacturing.

The steel is galvanized directly by immersion in a bath of molten zinc (SENDZIMIR process) according to the French norms NFA 36321 and NFA 36322.

The thickness of the coating is about 15 microns per side (275 gr/m²).

After site welding or cutting cold galvanization is carried out by SENDZIMIR.

Process the bolts and nuts allowing fixation of the cable trays are electro-galvanized.

7.5.2 Cable Warning Tape:

Cable warning tape, bright yellow in colour and of plastic material 300 mm wide by 0.1 mm thick, shall be supplied. The tape shall be continuously and indelibly marked in English and an Urdu translation with the words:

CAUTION x CAUTION x CAUTION

Check Cable should be block. The tape shall be installed in accordance with these Specifications.

7.5.3 Cable Trenches:

The Trenches shall be laid true to line and shall be completely embedded in concrete, with a minimum 150 mm thickness of grade 20 MP a surrounding the ducts on all sides. Ducts shall be sealed at each end after installation of the cable with split hard wood plugs and bitumen or by other approved means to exclude water and vermin.

7.5.4 Cable Protective Covers:

Cable protective covers shall be of reinforced concrete and, unless otherwise approved, shall be 300 mm wide, 50 mm thick and 1 mm long. The covers shall be designed for

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interlocking one with the other, both vertically and laterally. Special covers shall be provided where required for short radius bends. All cable protective covers shall meet the requirements of BS 2484.

The covers shall have the legend "ELECTRIC CABLE" cast into the upper surface and shall be installed in accordance with these Specifications.

7.6 TOOLS AND SPARE PARTS:

7.6.1 Tools:

1 (one) set of all tools needed for connection and repair of any kind of cable supplied.

7.6.2 Spare Parts:

The contractor shall include a list of recommended spare parts considered needed for a period of 5 years of service.

In addition the Contractor shall deliver one 200 m spare length of all types of cables used.

7.6.3 Cable Laying:

All cables shall wherever possible be laid in one single length without joints.

Medium voltage cables, low-voltage power cables and control cables shall as much as possible be segregated from each other throughout the entire plant.

Cables shall be installed on cables trays, except cables in ducts, trenches or cables protected by piping.

The cable trays shall be designed to allow the laying of the cable from the side(s) without pulling through. All racks and fixing devices shall be hot-dip galvanized.

The Contractor shall in due time give all necessary information to the Engineer about the proposed exact location and the dimensions required for cable ducts and cable trays.

Where required for the overall earthing system a copper earthing wire of minimum 50 mm cross section shall be laid together with the cables on cable trays, in trenches.

7.6.4 Tests:

Factory and site tests shall be performed in accordance with the applicable IEC standards, or other approved standards.

Type test certifications shall be submitted on request

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GENERAL

Wherever specifically called for by means of notes on the contract drawings or by written order of the Engineer the Contractor shall furnish and place sand or pea gravel bedding under lines and other structures as a separate item of payment.

8.1 SOURCE OF BEDDING MATERIAL

Sand or pea gravel for bedding shall be from a source and of specifications approved by the Engineer.

8.2 PURITY AND STACKING

The sand and gravel shall be free from clay, salt, alkali, organic matter, shale, loam, soft flaky particles and other deleterious substance. It shall be stacked at the place designated by the Engineer and kept free from the admixture of deleterious materials mentioned herein.

8.3 PLACING OF BEDDING MATERIAL

The material for bedding shall be placed to the specified thickness and compacted by rammers of approved weight.

8.4 MEASUREMENT

The measurement shall be made by volume for the actual quantity of the work done and the unit of measurement shall be one cubic feet.

8.5 PAYMENT

Payment for this item of work shall be made for the actual quantity of work done as specified in this section, at the unit rate quoted in the priced Bill of Quantities.

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9.1 GENERAL:

This section describes the earthing system and other installations.

9.2 REFERENCES:

The design, installation and testing shall comply with the below listed recommendations:

WAPDA	Specification P-190:91 Grounding Sets.
WAPDA	Specification P-116:81 Earthing Rods.
IEEE 80	Earthing
IEC	Safety handbook
IEC 950	Safety of information technology equipment, including electrical business equipment.
IEC 364	Electrical installations in buildings
ANSI/IEEE 665	Generation station grounding

9.3 SCOPE OF WORK OF CIVIL CONTRACTOR:

The contractor shall be responsible for engineering, supply of complete material testing of earthing system and lightning protection system for Complete Mazar and structures etc. The contractor shall submit design calculations giving touch, step potential, grid potential rise based on actual soil resistivity to be measured by him.

The Electrical Works Contractor shall supply all material and equipment for the buried and embedded main earthing electrode and risers, carry out the placing of the earth conductors, and make all the connections, including earthing connection to reinforcement bars. The Electrical Works contractor shall supply the civil contractor with all information and instructions needed, such as equipment location drawings etc. for the execution of their works, as well as cooperate closely with the civil contractor during the execution of the works.

The Civil Contractor work will extend upto the earthing terminal bars/plates at designated points connected to the risers of the buried/embedded earth electrodes in all areas.

9.4 SCOPE OF ELECTRICAL CONTRACTOR:**9.4.1 General:**

The Electrical works contractor shall be responsible for connection directly to earth of all steel structures but not limited to the following.

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- The above-floor earthing system from the terminal bars to main machinery and equipment, such as generator, transformers, switchgear, Lighting arresters etc.
- The above ground earthing system of all the steel structures, with all connections to metal parts and equipment and to the risers of the buried earth electrodes.
- All interconnections of the different earthing systems.
- For all areas, the earthing system shall extend to all metal parts, even if these do not constitute a conducting part of an electric system of the works, such as machinery operating panels, cat-walks piping, sewers, rails, metal tanks, lighting fixtures, cable racks, etc.

9.4.2 Earthing Conductors:

All risers from the earthing electrode system shall be connected to the main bars (at minimum 30 m intervals and at least 2 risers to each bar) by removable screw connections.

The conductors for the earthing bars and internal connections in panels and boards, all other earth conductors shall consist of electrolytic, stranded copper conductors. For connection to other metal parts the ends of such conductors shall be fitted with cable lugs, rigidly fastened to the earth conductor by means of a hydraulic press. Interconnections between earth conductors are to be performed with straight joints or T-joints terminated in the same manner.

Main mesh conductors shall have a minimum section of 95 mm².

The conductors shall be reliably protected against mechanical damage and corrosion.

The following equipment shall be connected directly to the earth electrodes or the risers:

- The turbine casing and inlet valves.
- The generator housing. Each housing shall be connected to two separate riser, connected opposite each other.
- All power transformer neutrals and transformer tanks. Main transformer tanks shall be earthed on two points, by different risers.
- All steel structures in the outdoor switchyard and grid station.
- All lightning arresters, the earth conductor from the arrester to the counter, as well as the in terminal of the counter shall be suitably insulated or screen - protected against accidental touching and shall be of minimum 2 x 95 mm².

Each item shall be directly connected to an earthing conductor to the housing shall be provided. Each of the cores and neutrals shall be done on the transformers and not on the terminal boxes.

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The fence (if not separately grounded) and other fences for transformer cells, etc. shall be earthed to the earthing wire at intervals of not more than 20 m and to the earthing electrode system at all corners and gates. Gates shall be connected to earthed gateposts by a flexible copper braid or equivalent. flexible copper braids of minimum 35 mm² shall also be used for connecting all sections of pipes, metal trays, conduits, rails, cable racks, etc. unless these are welded together or each section or separately earthed.

Earthing conductors for electronic systems shall be insulated and shall run separately from the systems, panels, etc. directly to a main earthing bus close to a connection to the earthing electrode system. These earthing conductors shall be of minimum 50 mm² and shall not be branch off from the earthing of the power systems.

9.4.3 Earthing Conductor Connections:

Connections between the main earth ring and the branch earth conductors shall be made with brass lugs hard soldered to the copper strand and tinned, riveted and sweated to the main earth bars or by exothermic welding or equal to the approval of the Engineer.

Stranded earthing conductors between any two points shall be in a continuous length and be straight. Through jointing is prohibited.

No reliance shall be placed on the conductivity of metal to metal joints in structural or equipment metalwork to provide earth continuity.

9.4.4 Frames Earthing:

The frames of all electrical and lower voltage equipment shall be joined by auxiliary earth bar connections to the nearest point on the main earth or bars. The switchboards shall have two such connections to the earth bar on each switchboard.

9.4.5 Neutral Earthing:

The neutral earthing points on the equipment shall be connected to earth in accordance with the single line diagrams or as directed by the Engineer.

9.4.6 Fence Earthing:

All fences, band railing, associated gates and post, etc. shall be earthed to protect against electric conductors, due to rise in potential as a result of direct contact of the fence with live electric conductors, due to indirect coupling with the energized equipment or due to lightning strikes. Fence shall be earthed by providing earth rods driven in the ground at suitable intervals and/or connecting these to the buried earthing conductor where provided. The final layout of the earthing of the earthing system shall be to the approval of the Engineer.

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9.4.7 Lightning Protection:

Lightning protection system for the building shall be supplied by the manufacturer and submitted to the Engineer for approval. All equipment shall be installed in accordance with the approved layout drawings. Connections to lightning points shall be taken by the shortest possible route without bends down to ground level or the earthing ring for connection to an earth electrode or the adjacent earthing system.

9.5 TESTS:

After the on-site construction, the resistance to earth of each earthing electrode system shall be measured. The earthing system in all the installations shall be measured collectively under operation conditions and shall be disconnected into separate systems for measuring of the separate elements of the system. The Contractor shall suggest the measurement setup for approval by the Engineer.

The earthing electrode systems shall be checked for resistance and reliable connections.

Complete underground earthing system shall be checked and tested to prove its adequacy as per relevant standards and these specifications and to the satisfaction of the Engineer. Test results shall be recorded.

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G - 1. GENERAL:

The stipulated therein, the direction as given below shall invariably be read with Section of the Special Provision of the Contract.

The materials used and workmanship shall be of highest quality and grade and shall conform to the latest specifications of British Standards and Codes of Practice "Water Supply", "Sanitary Pipe Work", "Building Drainage", Surface "Water and Sub-Soil Drainage" and applicable to details and work indicated on the Drawings and Bill of Quantities or otherwise approved.

G - 2. DRAWINGS AND INFORMATION REQUIRED:

- a) The Contractor shall submit shop drawings for the entire installation including installation details for all items required or asked for approval of the Consultants.
- b) Approval by the Consultants of shop drawing for any material, apparatus, devices and layout, shall not relieve the Contractor from the responsibility of furnishing same of proper dimension, size, quantity and all performance characteristic to efficiently perform the requirements and intent of the Contract Documents. Such approval shall not relieve the Contractor from responsibility for errors of any sort in the shop drawing.
- c) If the shop drawings deviate from the Contract Documents the Contractor shall advise the Consultants of the deviations in writing accompanying the shop drawings including the reasons for the deviations. At the start of the Project the Contractor shall periodically and thereafter submit to the Consultants a list of all shop drawings which will be submitted in the course of the project. The list shall show the disposition of each item including date of submission approval etc. The list shall be kept upto date through the entire course of construction.

G - 3. CLEANING AND PROTECTION:

- a) The Contractor shall be responsible for his work until its completion and final acceptance, and shall replace any of the same which may be damaged, lost or stolen without any additional cost to the Owner.
- b) The openings left in floor for passage of lines of soil waste, vent and supply pipes shall be covered and protected.
- c) The pipes shall be protected with suitable covering as soon as set. All open ends of pipes shall be closed by a plug fitting to prevent obstruction and damage. The use of new permanent water closets and other new plumbing fixtures during the progress of work is prohibited.
- d) As soon as installed, all metal fixtures trimmings shall be thoroughly covered by this Contractor with non-corrosive grease which shall be maintained until all construction work is completed.

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SECTION - G: PLUMBING WORKS - GENERAL

- e) Upon the completion of the work, all fixtures and trimmings shall be thoroughly cleaned and polished and left in first class condition.
- f) Prior to delivering the plant to the Owner the Contractor shall thoroughly clean all equipment fixtures, fittings etc.
- g) Before final connections are made and before operation of equipment and piping, all piping interior shall be thoroughly blow out, or washed out at least twice in a manner as directed by the Consultants remove all accumulation of dirt chips or other deleterious materials. Make all temporary connections and furnish all appliance required for the purpose of cleaning at no extra expense to the Owner.
- h) Before erection, all pipes, tubing, valves and fittings shall be thoroughly cleaned of oil, grease or other combustible materials by washing in a hot solution of sodium carbonate or trisodium phosphate mixed on the proportions of one pound to three gallons of water.

G - 5 RECORD DRAWING:

- a) During construction the Contractor shall keep an accurate record of all deviations between the work as shown on the Contract Drawings and that which is actually installed.
- b) The Contractor shall secure from the Consultants after approval of his Shop Drawings a complete set of drawings and note changes thereon in ink
- c) The Contractor shall make a complete record of all changes and revisions in the original design which exist in the completed work.

The cost of furnishing above prints and preparing these for record "shall be deemed to be included in the tendered cost and its effect spread over other items of work, and as such item shall not be a subject to payment "When all revisions showing the work as finally installed are made, the corrected Original Transparencies shall be submitted to the Consultants for review and delivered to the Engineer before final payment for the completed work will be made.

G - 5 OPERATING AND MAINTENANCE INSTRUCTIONS:

Three sets of operating and maintenance instruction covering completely the operation and maintenance of all plumbing equipment, controls, heaters, pumps and the like shall be furnished to the Owners.

G - 6 INSPECTION AND TESTING OF WATER MAINS AND WATER SUPPLY SYSTEMS:

The Main should be tested in sections as the work of laying proceeds and joints should be left exposed for inspection during testing. After completion of each section, the main should be carefully and solely charged with water so that all air is expelled, allowed to

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sand full of water for 1 - 2 days if possible and then tested under pressure plus 50% whichever is the greater.

The pressure should be applied by means of a manually operated test pump or, in case of long mains or mains of large diameter, by a power-driven test pump provided that the pump is not left unattended. Precaution must always be taken to see that in test pressure is not exceeded. Pressure gauges must be accurate and if necessary should be re-calibrated before the test.

After the pump has been stopped, the test pressure should be maintained as long as is necessary to inspect the whole of the pipe work under test and in any event not less than half-an-hour. Open ends of mains should be temporarily closed for testing under moderate pressure by fitting watertight expanding plugs. The end of the main and any test plug must be well secured to resist the end thrust of the water pressure in the main, i.e. maximum test pressure \times cross sectional area of pipe. If the section of main terminates with a sluice valve, the wedge of the valve should never be used to retain the water because this might lead to permanent distortion of the working parts of the valve. Instead the valve should be fitted with a blank flange or socket plug and the valve left in the open position whilst testing. End support should be provided as explained previously.

Cold Water Systems:

When the installations are complete they should be slowly and carefully charged with water, allowing all air to escape thus avoiding shock or water hammer. The system should be inspected under working conditions of pressure and flow and when all draw off taps are closed, should be absolutely watertight. Each draw off tap should be opened and tested for rate of flow. Certain specifying authorities may require pressure testing of internal pipe work in which case, systems should be tested in accordance with the pressure test previously described. In such cases it may be necessary to isolate items of equipment from the pressure test if they are not capable of withstanding the test pressure. Where these items are removed, blanking flanges or plugs must be used or a make-up piece of pipe work installed temporarily.

All piping, fitting and appliances should be inspected and checked for satisfactory support and protection from physical damage corrosion and frost.

Because of the possibility of damage in transit, it is always advisable to re-test cisterns, tanks and cylinders for water-tightness on arrival at site and before fixing.

Hot Water Systems:

Hot water systems should be thoroughly flushed out and then tested in the same manner as described for cold water systems. Where thermal insulation is used, the hydraulic test should be made before the insulation work is completed and whilst all joints are exposed.

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Where a pressure test is employed, boiler and clarifier relief valves should be removed and these valves should be tested later. The test pressure should be one and half times the normal working pressure and this should be maintained for thirty minutes after making good any leaks.

It is necessary to carry out the hydraulic pressure test on sections of pipe work prior to completion of the whole installation where these are fixed in ducts, chases, trenches, etc. and are concealed from view. If rectification of faulty materials of workmanship on such sections is likely to involve disturbance to finished structural features, the test pressure should be twice the normal working pressure.

Sterilization of Cold Water Systems

The whole of the system should be sterilized to eliminate possible traces of bacteria.

Sterilization of public water mains is carried out by the Water Authority who may also carry out the sterilization of new private mains. Where this is not standard practice, the plumbing contractor should carry out the sterilizing process as described below.

After cleaning the cistern of all debris, the cistern and pipe work should be filled with water and the whole thoroughly flushed out. The system should be then filled with water a second time, but as the cistern is filled, sterilizing chemical containing chlorine should be added to ensure thorough mixing of the chemical and water. If ordinary bleaching powder is used, the proportion should be 150g of powder to 1000 liters of water, the powder first being mixed with water to creamy consistency before being added. Proprietary brands of sterilizing chemicals should be added in the proportions as instructed by the manufacturers.

After filling the system, the incoming water supply should be shut off and each tap on the distributing pipes opened successively, starting with that nearest the cistern. As the water which issues from each tap begins to smell of chlorine, the tap should be closed. The cistern should then be filled again to water-line with water to which has been added the correct dose of chemical.

The whole system should be allowed to stand charged with treated water for a period of at least 3 hours, after which a test should be made by smell for residual chlorine. If none is found, the sterilization should be repeated.

Before any water is used for domestic purposes, the whole system must be emptied and thoroughly flushed out with clean water.

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SECTION - 1: WATER SUPPLY WORK (G.I WORK)

1.1 DESCRIPTION:

Work in this section shall include supply and installation of all the G.I pipe work upto 6" (150 mm) including all material, plants, equipment, labour etc. to complete the work in closed conformity with the plans and in accordance with the provisions included herein.

1.2 MATERIAL REQUIREMENTS:

All un-installed pipes and fittings used in the building work whether hidden in block/concrete work or running under ground shall be of Galvanized Iron hot dipped in bitumen, wrapped around with bituminous Hessian with final two coats of brush applied bitumen.

It shall be insured that the fittings shall be tested by jointing at least 5% of them to straight pipes in pipe vices with sufficient pressure, to the satisfaction of the Engineer. Defective fittings invariably crack on application of the pressure. The fittings shall also be examined to detect blisters and minor cracks. The G.I pipe, fittings and specials shall conform to the following specifications:-

a) G.I Pipe

- o BS - 1387: Class - M
- o Test Pressure = 700 psi

b) Malleable Iron (Galvanized Fittings (i.e. coupling, elbows, Tees etc.) for G.I Pipes 2 - 1/2" and below shall be of at least same thickness and quality a G.I Pipe.

c) Cast Iron threaded flanges for joining G.I Pipe of dia 3" and above.

- o BS-10: 1962, Table D.

d) Cast Iron flanged fittings, for G.I. pipe 3" and above.

- o BS-2035, 1953: Class-B
- o Working Pressure = 400 ft. of water.

e) Expansion Joints in G. I. Pipes.

Adequate provision for expansion shall be provided on all pipe work as shown on the drawings. The contractor shall obtain the Engineer's approval for the materials being used for a particular expansion joint. Expansion loop for Horizontal G. I. Pipe of dia 3" or below.

f) Cast Iron Sluice Valve (size 3" and above)

- o Cast Iron body; Gun metal spindle and sealing rings.
- o BS-3464, flange to BS-10; 1962

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SECTION – 1: WATER SUPPLY WORK (G.I. WORK)

- o Test Pressure = 225 psi.
- g) Copper alloy sluice valve (size 2 – 1/2" and below)
 - o BS – 1952; threaded ends.
 - o Test Pressure = 225 psi
- h) Cast Iron Check Valve (Size 3" and above)
 - o Cast Iron body; Gummetal door.
 - o Test Pressure = 225psi.
- i) Copper Alloy Check Valve (Size 2 – 1/2" and below). Threaded ends.
 - Test Pressure = 225 psi.

C.I. globe valves (Size 2 – 1/2" and above). Similar to Cast Iron Sluice Valve.

Copper alloy globe valve (Size 2 – 1/2" and below). Threaded, Test Pressure = 225 psi.

Fire Hydrant:

Shall conform to BS; 750, with a body of Cast Iron and spindle of Manageness-bronze. The direction of closing shall be by Clock wise rotation and the outlet shall have screwed joints for accommodating 2 – 1/2" dia hose connection.

Double Air Valve:

Cast Iron body				
Max. Working head.				
Din (in).	2	3	4	6
Head (ft).	200	575	575	575

Pressure Reducing Valve:

The valve shall maintain a constant downstream pressure regardless of changing flow rate and/or varying inlet pressures. It shall be spring loaded, hydraulically operated, pilot-controlled diaphragm-type globe valve. The valve shall have a single removable seat and seat and resilient disc. The body and cover of the valve shall be of cast iron for valves of size 3" or above and shall be of cast bronze for size 2 – 1/2" or below. The inlet and outlet of valve shall be threaded fro size 2 – 1/2" or below and flanged for sizes 3" or above. The working pressure fro valve shall be 175 psi minimum and the valve permit a convenient

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SECTION - 1: WATER SUPPLY WORK (G.I. WORK)

adjustment over a range of no less than 30 psi. The threaded valve shall be installed with two unions at its inlet and outlet end of facilitate its removal. All pressure reducing valve assemblies will be installed with bypass line having globe valve/gate valves so that removal of P.R. Valve for servicing/repair will not disturb the service of that circuit.

Strainer:

The straight cast iron strainer shall be installed on the submerged end of suction pipe drawing water from ground water from reservoir. The strainer flange shall conform to the specifications of BS 10, 1962. Minimum length of strainer from the specified dia shall be as follows:-

<u>Dia</u>	<u>Length</u>
3"	5 - 11 1/8"
5"	7 - 1 1/2"

The strainers shall have cast iron or bronze bodies suitable to withstand the working pressure, removable screens of copper, brass, nickel or stainless steel, flanged bodies with tapings for size 1 - 2 1/2" and above and of such a design as to allow blowing out of accumulated dirt and easy removal and replacement of strainer screen without disconnecting the main piping.

Puddle Plates:

Puddle plates of specified dia, shall be provided where G.I pipe crosses R.C.C. wall retaining water or soil. 3/8" thick M.S. square plate of size shown on plan. Cut with hole equal to external dia of pipe, shall be welded with the pipe with both ends of G.I. pipe provided with flanges, and the whole assembly shall be hot-dipped galvanized before being cast in R.C.C wall.

Float Valve, Level Controller, Flow Switch:

Tender to provide Specifications of items locally available.

a) Float Valve:

The float valve shall be direct float operated valve having globe body. The valve shall close drop-tight, at pre-set maximum water level, against pressures of upto 70 psi and shall open and close in direct proportion to rise or fall of water level.

The valve shall be of all brass construction with copper float and replaceable rubber seat and shall be furnished with threaded inlet and outlet ports for sizes 1 - 1 1/2" and below. For sizes 3" and above, the valve body shall be of cast iron with copper float, replaceable rubber seat and flanged ends.

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The space available for the float valve, above, maximum water level and location of valves shall be as shown in the Plans.

b) Liquid Level Controller:

Liquid Level Controller, (float less type) comprising of control unit (if dual tank system) probe fittings complete with the electrodes and electrode holders suitable for operation on the Single Phase, 240V, 50 Hz supply shall be employed wherever shown on the Plans. The controller shall have built in surge arrestor. There guaranteed electrical life of the controller shall be 5x50000o operations minimum and the minimum tolerance of the rated voltage shall be + 15%.

c) Pipe Sleeves for Iron Pipes:

The Contractor shall supply and install the pipe sleeves in partition walls, RCC walls, slabs and other structural elements slabs. The pipe sleeves shall be located accurately and they shall be properly aligned and tied with the reinforcement bars so that the alignment and level is not disturbed during construction.

The RCC wall pipe sleeves shall be fabricated from correct size Schedule 40 M.S. pipe. M.S. 3/8" thick sheet ring of sleeve size +8" shall be welded at the centre line sleeve shall be heavily galvanized before installation. The inner galvanized surface shall be smooth.

RCC slab pipe sleeves shall be of construction as above but fabricated from 3", 4", 5" and 8" dia Schedule 40 M.S. pipes and anchor ring shall be of 9-1/2", 10-1/2" 11-1/2" and 14-1/2" dia respectively.

d) Pipe Seal for Cast Iron Pipes.

All exterior openings provided for the passage of piping shall be properly sealed with snugly fitting collars of metal or other approved rat-proof material securely fastened into place.

1.3 CONSTRUCTION REQUIREMENTS

EXCAVATION & REFILLING OF TRENCHES FOR PIPE WORK:

The trenches shall be set out to suit alignment of the pipe lines. The trenches shall be carefully trimmed at sides and bottom compacted so that pipe lines when laid shall rest on the natural bed throughout the length. Shallow joint holes being left for the joint, where necessary. Where pipe line is to be laid in plains the depth of Cover, i.e. the normal distance from ground level to other top of the pipe be kept at about 80 cm (2'-9") and shall not be less than 75 cm (2'-6") except due to special reasons the Engineer directs in writing to the contrary. The maximum depth of trench shall be taken as shown under:

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SECTION - 1: WATER SUPPLY WORK (G.I WORK)

I	II	III
For pipes upto & including 38 mm 50 cm Depth (20")	For pipes 50 mm to 75 mm (2" to 3") 50 cm Depth (22")	For pipes over 75 mm (3") dia 60 cm Depth (24")

After the pipes have been laid, jointed and tested and proved to be water tight the trench will be filled in 15 cm (6") layers compacted and watered as required. Before that 6" thick sand cushion shall be provided around the pipe.

The various materials excavated to be separated and stacked, so that in refilling they may be again related in the same order, and thus least possible damage be done to public roads, cultivated fields, etc.

1.4 JOINTING SCREWED JOINTS

LAYING & JOINTING G. I. PIPES:

All screwed joints, shall be examined before jointing to ensure that the threads are perfect. In case of any flaw proper dies be used to make threads before they are jointed. The screwed ends of the pipes or specials to be jointed, shall be very slightly tapered so that as the jointed is screwed up, the threads shall bind together more and more tightly to ensure water tightness. The jointing work shall be so arranged in case of every joint that the two ends of pipes or specials jointed thereby shall be equidistant from the middle of the socket and shall have a space of not more than about a quarter of an inch between them in the centre of the socket. Before any joint is made all burrs from the ends of the threaded joints shall be removed. For ensuring this purpose, hemp or jute or any material other than that described above shall no account be allowed to be used. The pipes shall be screwed up tightly with pipe fitter's tongs or wrenches to ensure that each and every joint is perfectly water tight against the test head of water.

1.5 FLANGES:

Flanged joints shall be provided at intervals of not more than 152m (500 Ft). Each flanged joint shall be made by inserting an accurately cut disc of tough multiply rubber insertion about 3.2 mm (1/8 mm) thick of approved quality between the flanges. The bolt holes in the rubber insert as well in the flanges shall be drilled to template. The bolts and nuts for all flanged joints shall consist of British Standard mild steel, hexagonal, round and hexagonal. The bolts shall be pulled up gradually and evenly by the use of standard spanners, so as to ensure a perfect joint.

1.6 BENDS, TEES AND OTHER SPECIALS:

Bends, tees and reducers and other special shall be provided and jointed at points as shown on the drawings or as directed by the Engineer. All changes in direction shall be

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effected by means of bends wherever practicable and the use of elbows shall be restricted only to cases where there is no room for bends. In such cases only round elbows will be allowed.

1.2 TEST:

All pipe lines in course of or after laying and jointing but before being covered, shall be tested hydraulically, using a test pump fitted with accurate pressure gauge to be approved by the Engineer to test pressure of at least 1.5 times their normal operating pressure. All pipes, specials and fittings with their joints shall remain perfectly water tight under the full test head for a period of not less than two hours after the whole length of the pipe line has been examined and demonstrated to be water tight.

1.3 PIPES ATTACHED TO WALLS OR CEILINGS:

- a) Provide suitable and substantial mild steel duly enamel coated hangers and supports for all horizontal and vertical line of approved types and made special vibration eliminating and flexible hanger shall be provided for all pipe work affected by moving machinery or expansion and contraction including building expansion joints.
- b) Hot and Cold horizontal piping shall be supported in accordance with the following schedule:

Pipe Size	Minimum Hangers	Rod Size
Spacing		
1- 1-1" and smaller	8 feet-0 inch	3/8"
2- 1-1/4"-2 inch	9 feet-0 inch	3/8"
3- 2-1/4" inch	10 feet-0 inch	1/2"
4- 6" and larger	12 feet-0 inch	1/2"

- c) Hanger shall be supported from approved concrete inserts in concrete slabs for all pipes 2" and above. Insert shall be as approved by the Engineer, and shall have space for nuts of all size. All inserts shall have a reinforcing rod of specified diameter to be installed through slot provided for this purpose, and the Contractor shall be responsible for its being in place when concrete is poured. The Contractor shall place all inserts in pour for all pipes which are to be hung, in ample time to allow the Contractor for general consideration to perform his work on schedule. If any pipe has to be hung in space where no inserts have been provided, the Contractor shall drill holes from below through concrete slabs and

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provide rods and hangers attached to not less than two approved type expansion shield each one capable of taking full maximum load. The rods and complete hangers shall be of adequate size to support the load which they carry.

- d) Provided approved roller supports, floor stands wall brackets, masonry, etc. for all lines running above the floors, and which can be properly supported by the floors or walls. Pipe lines near walls may also be hung by hangers, carried from approved wall bracket at a higher level than the pipe.
- e) No piping shall be hung from the piping of other trades or other piping except for small water branches in toilet where no other practical means of support can be found, in which case specific approval of the installation shall be obtained from the Engineer. Hangers shall not be fastened by means of vertical expansion bolts; hanger shall be of heavy construction suitable for the size of pipe to be supported. All materials, except roller shall be a malleable iron or steel. Rollers shall be cast iron. Hanger shall be swivel split ring, wrought pipe clamp, or adjustable type or as approved.
- f) Special care shall be taken in the placing of hangers at the top, bottom and in offsets of hot water risers, so as to allow for expansion of the vertical piping. Vertical risers shall be securely supported from the building construction by means of pipe clamps at every floor, or as too short to connect to the building construction.
- g) For cast iron hub and spigot pipe and fittings hangers shall be provided on not more than 5 feet centers or a minimum of one hanger per each length of pipe. Where excessive number of fittings is installed between hangers, the Contractor shall provide additional hanger or reinforcing as required and to the satisfaction of Engineer. Securely anchor fittings to the building construction changes of direction to eliminate all horizontal movement. The Contractor shall furnish and install steel channels and angles for piping support. These supports will be required at those floors which are not slabbed over and/or where the building structure is not directly useable for pipe support.

1.9 PIPES SLEEVE:

Every pipe line laid through any RCC walls, floor, ceiling or roofs shall be arranged to pass through proper hot dipped galvanized sleeve pipes as approved by the Engineer or ample diameter embedded therein to enable the pipe lines to pull easily and freely. The length of every such sleeve pipe shall be of the full width or thickness of the wall and in the case of roof, ceiling or floor, shall be at least 4cm (1-1/2") longer than the thickness thereof and shall project to that extent above the upper surface thereof unless the Engineer orders to the contrary.

1.10 INSULATION FOR HOT WATER LINES:

All hot water lines shall be insulated with sectional fibre glass insulated properly wrapped by 4 ounce canvas in the approved manner and as directed by the Engineer.

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The hot water circulation and hot water main and branches of sizes 2" and above shall be insulated with 1 inch thick insulation, while all other hot water pipes and fixtures branches shall have minimum thickness of 1/2" insulation.

All fibre glass insulation shall be of sectional type having a minimum density of 4 lbs. per Cft.

After insulation, buried or embedded hot water pipes and branches, shall be wrapped with bituminised Hessian with final two coats of brush applied bitumen to make the entire insulated piping totally water proof. All pipes insulation exposed to the sun shall be protected with G.I cladding.

1.11 DISINFECTION FOR WATER SUPPLY:

After the testing of the pipe work has been satisfactorily completed and when approved by the Engineer, the Contractor shall disinfect the pipe lines by dispensing chlorine solution through the entire pipe network to obtain a minimum chlorine content of 50 mg/litre for a contact period of at least 30 minutes the procedure and equipment used to introduce, disperse and test the chlorine in the pipe shall be subject to approval by the Engineer.

1.12 MEASUREMENT:

The pipe work 150 mm (upto 6" dia) shall be measured in running foot and no separate measurement will be done for tees, bends, elbow, unions and other fittings. Unit of measurement for pipe work shall be taken along the centerline and unit of measurement will be one linear Ft.

1.13 RATE AND PAYMENT:

The rate shall include all cost of material i.e. pipe, fittings, jointing material, lubricant, sleeve pipes, hangers and clamps, fibre glass insulation and labour of every type and incidentals.

1.1 DESCRIPTION:

Work in this section shall include 2 ½ supply and installation of all the Polydex PPRC pipe lines for cold and hot water supply work as per DIN 8077/8078 and DIN 16992 for fitting including all materials, plants, equipment, labour etc. to complete the work in close conformity with the plans and in accordance with the provisions included herein.

1.2 MATERIAL REQUIREMENTS:

All un-installed pipes and fittings used in the building work whether hidden in block/concrete work or running under ground shall be of polydex PPRC pipe lines and fitting as specified above and jointed with socket fusion method at 260 C as approved by the Engineer and as per instruction of the manufacturer. It shall be ensured that the fittings shall be tested by jointing at least 5 % of them to straight pipes in pipe vices with sufficient pressure, to the satisfaction of the Engineer. Defective fittings invariably crack on application of the pressure. The fittings shall also be examined to detect blisters and minor cracks. The pipe, fittings and specials shall conform to the following specifications:-

- a) Polydex PPRC pipe
 - o DIN 8077/8087: Class-B
 - o Test Pressure = 300 ft.
- b) Fittings (i.e. coupling, Elbows, Tees etc.) for polydex PPRC Pipes 2 – ½" and below shall be of at least same thickness and quality as per DIN 16963 ISO 3633 & PS 3214.

1.3 LAYING & JOINTING POLYDEX PPRC PIPES:

All fittings, shall be examined before jointing to ensure that are perfect. In case of any flaw be replace with proper. The pipes shall be screwed up or fitted tightly with pipe fitter's tongs etc to ensure that each and every joint is perfectly water tight against the test head of water.

1.4 CONSTRUCTION REQUIREMENTS

1.4.1 Excavation & Refilling Of Trenches for Pipe Work:

The trenches shall be set out to suit alignment of the pipe lines. The trenches shall be carefully trimmed at sides and bottom compacted so that pipe lines when laid.

1.4.2 Bends, Tees and other Specials:

Bends, tees and reducers and other specials shall be provided and jointed at points as shown on the drawings or as directed by the Engineer. All changes in direction shall be effected by means of bends wherever practicable and the use of elbows shall be

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SECTION - 1A: WATER SUPPLY WORK (PPRC WORK)

restricted only to cases where there is no room for bends. In such cases only round elbows will be allowed.

1.4.3 TEST:

All pipe lines in course of or after laying and jointed but before being covered, shall be tested hydraulically, using a test pump fitted with accurate pressure gauge to be approved by the Engineer to test pressure of at least 1.5 times their normal operating pressure. All pipes, specials and fittings with their joints shall remain perfectly water tight under the full test head for a period of not less than two hours after the whole length of the pipe line has been examined and demonstrated to be water tight.

The Contractor shall furnish and install steel channels and angles for piping support. These supports will be required at those which are not slabbed over and / or where the building structure is not directly useable for pipe support.

1.4.4 PIPES SLEEVE:

Every pipe line laid through any RCC walls, floors, ceilings or roofs shall be arranged to pass through proper hot dipped galvanized sleeve pipes as approved by the Engineer or ample diameter embedded therein to enable the pipe lines to pass easily and freely. The length of every such sleeve pipe shall be of the full width or thickness of the wall and in the case of roof, ceiling or floor, shall be at least 4 cm (1-1/2") longer than the thickness thereof and shall project to that extent above the upper surface thereof unless the Engineer orders to the contrary.

1.5 MEASUREMENT:

The pipe work shall be measured in running foot or meter and no separate measurement will be done for tees, bends, elbows, unions and other fittings. Unit of measurement for pipe work shall be taken along the centerline and unit of measurement will be one linear Ft/m.

1.6 RATE AND PAYMENT:

The rate shall include all cost of material i.e. pipe, fittings, jointing material, lubricant, sleeve pipes, hangers and clamps and labour of every type and incidentals.

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2.1 DESCRIPTION:

Work under this Section includes supplying and fixing all sanitary works including English type W.C., squatting, or Asiatic W.C. wash hand basins, urinals sinks, low down and high level cistern, automatic flushing tank showers, Taps, Valves and Fire Hydrant. Also any special fixtures called for on the plans and mentioned in the Bill of Quantities.

2.2 MATERIAL REQUIREMENTS:**2.2.1 PLUMBING FIXTURES AND FITTINGS:**

- 1- European type water closet of not less than 19" (475 mm) clear opening between flushing rims in white earthenware best quality (local made) "P" or "S" trap 3 gallons (13.5 litres) enameled, wall type flushing tank, enameled flush bend, PVC symphonic type fittings complete with corrosion resistant alloy ball valve of best quality manufacture in Pakistan. Standard seat and cover with PVC rings and nuts and rubber buffers, etc. complete.
- 2- Asia/Orrisa type water closet of not less than 19" (475 mm) clear opening as measured between flushing rims with raised foot rest in white earthen ware best quality (local made) with back or front flush, specified dia C.I. trap of the same make, 3 gallons (13.5 litres) plastic/ceramic cistern flushing tank plastic ball valve of Asia or equivalent 1-1/4" (31 mm) dia telescopic flush C.P pipe of the same size fixed to wall with PVC/C.P saddle.
- 3- Wash basin of specified size in white colour earthen ware best quality mounted on C.I. brackets fixed to wall, (local made) with 1/2" (15 mm) C.P. waste chain plug, local made heavy counter sunk screws, C.P. type cock heavy duty with 1/2" (15 mm) C.P. inlet connection 1/2" (15mm) C.P. brass union nuts washers, including pedestal 2 coats of approved enamel paint to C.I. brackets.
4. Urinal size 17" (425 mm) in white earthen ware best quality (local made) with pull/push valve globe valve chrome plated.
5. The shower roses shall be chromium finish universal type with adjustable spray of best quality local made as per approval.
6. The sink shall be of stainless steel best quality local made with all accessories as shown on drgs.

NOTE

1. European type W.C., Asian type W.C., Wash Hand Basin and Urinals shall be approved make.
2. C.P. brass waste and union 1-1/2" 1-1/4" (38 mm/31mm) dia with PVC/C.P. down pipe to be provided for sinks and wash hand basins.

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2.2.2 Showers:

The shower head shall be chromium plated with fountains of size specified in the B.O.Q. or as approved by the Engineer.

Each shower shall be connected through a control valve to the hot and cold mixing valve. This shall be best quality manufactured approval shall be given by the Engineer.

2.2.3 Taps:

All taps shall be of heavy duty type, chromium plated or brass as applicable and be of approved manufacture.

2.2.4 Gas Heating Equipment:

The gas water heater shall be gas fired, direct, storage type with dual wall construction and be made of galvanized steel sheet. The heater shall be furnished with 1" dia drain pipe at bottom.

Eclectic water heaters, wherever specified, shall be direct type, fitted with electric immersion element and 3/4" dia drain plug. The body of heater shall be made of galvanized steel sheet.

The gas and eclectic water heater shall be locally manufactured and be able to sustain working pressures upto 50 psi without any leakage. The rated heat capacity of all the heating equipment in terms of BTU per hour or kE shall be such as to raise temperature of volume of water equal to the specified capacity of heater, by 55 degree centigrade, in one hour.

The heaters shall be furnished with temperature indicator, thermostat to control switch ON/OFF operation and pressure relief valve.

The Contractor shall submit following information about heating equipment, before installation.

- a. Manufacturer's technical Bulletin.
- b. Storage capacity (gallons), rated heat input capacity (BTU per hr/kW), Thermal efficiency etc.

Thermostatic Control Water Mixer Unit:

Where indicated on plans, thermostatic control water mixer unit shall be installed on hot and cold water pipes, near outlet of water heater to control the temperature of supply at source. The mixer unit shall be of import quality and made of stainless steel. The mixer unit shall operate satisfactorily for the following ranges of temperature.

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SECTION - 2:

PLUMBING & SANITARY WORKS

Output	temperature	41 - 45	degree centigrade
Input	temperature		
	Hot water	55 - 60	degree centigrade
	Cold water	10 - 20	degree centigrade

The Contractor shall submit manufactures technical bulletins, for the suggested mixer unit, for approval.

2.2.5 Hose Reel Cabinet

The hose cabinet shall be of 18 gauge heavy stock steel with joint. The face of cabinet metered, welded, ground finish and smooth with no visible seems or joints on face of cabinets. All joints shall be electrically welded. Doors to be furnished with full face wired plate glass panel, removable and secured with extruded vinyl glazing finish hinges shall be special alloy forged bronze, finished to exterior of cabinet. Knobs shall be semi-recessed, cam action latch, forged bronze with chrome plate finish set in stainless steel cup. No screw or bolts heads shall be used on face of cabinet. All concealed surface of cabinet shall be prime coated after fabrication to prevent corrosion. All interior exposed surface shall be finished in baked enamel to be confirmed by the Architect through Engineer for colour scheme. The exterior shall be prime coated and left in condition for finished painting. Cabinet shall be surface mounted as indicated or approved. The cabinet includes Hose-pipe 100 feet length with brass nozzle and coupling complete in all respects. The Cabinet includes 2-1/2" dia with 1" dia brass nozzle on discharge end. The hole assembly including hose pipe shall be tested for a minimum test pressure of 140 p.s.i.

2.3 CONSTRUCTION REQUIREMENTS:

2.3.1 Water Closets:

The work shall consist of providing and fixing in position squatting type water closet or European type water closet of an approved manufacturer white/light coloured (Prime/Export Quality). The squatting type an shall be of white vitreous China, glazed fire clay, or any other approved non-absorbent material with specified diameter trap of the same material and foot rest. The surface shall have a glazed finish with minimum of fouling area and a seal depth greater than 50 mm. The outlet shall be placed well back and the pan shall be sufficiently long to meet the design requirement. The flushing water connection shall be from the rear end.

The European type water closet shall also be of vitreous China made of an approved manufacturer with low level flushing cistern and with double seat cover. The W.C. shall be symphonic type with large water area and deep seal, the cleaning being effected by symphonic action. It shall have a low trap at the floor line so that the closet can not be untrapped by the emptying water

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The low level flushing cistern shall be of 13.6 litres capacity of Ceramic as specified in the BOQ. The Cistern shall be provided with a corrosion resistant alloy or plastic ball valve with float of dia not smaller than 100 mm and an additional 13mm cock and shall be provided with an over-flow pipe at least one size larger than the supply pipe, with a minimum internal diameter of 18mm and it shall be fixed on mild steel or cast iron cantilever brackets, if required and as shown on the Plans.

The flush pipe be 'plastic' PVC or chromium plated steel pipe. The holes for inlet, outlet and overflow in the cistern shall be made water tight by inserting rubber washes or other means of providing a water tight joint. The position of water closet shall be so arranged that it shall not face Qibia.

Every water closet shall be provided with a water supply bid tap for filling the small water cans on the site down position. A chromium plated toilet paper holder close to each water closet shall also be installed.

2.3.2 Sink:

Sink shall be of enameled iron or 18 gauge stainless steel of size as specified in the BOQ with self-contained drain boards of approved manufacturers. The sink shall be fitted with rubber plug and washers, 38mm dia chromium plated bottle or S trap with waste pipe with all necessary accessories for making the sink a complete units. The internal angles shall be of a design to facilitate cleaning with a fall towards outlet to drain the contents completely.

2.3.3 Service Sink:

If required shall be made of stainless steel of 16 gauge as approved by Engineer. The sink shall be used for drawing water for scrubbing and cleaning and to dispose off the contents of scrub buckets and vessels containing slops. The edge of the sink shall be placed about 600 mm above the floor to minimize lifting and to leave room for the trap beneath.

The water supply and drainage equipment for such sinks shall be similar to that floor kitchen sinks, except that no hot water supply or mixer will be installed.

2.3.4 Water Pump:

Pumps for Domestic Water, Fire Fighting, Drainage and Sewage Life Station:

The centrifugal pump-motor sets shall be heavy duty industrial type suitable for continuous and quiet operation.

The centrifugal pumps shall be single stage, small size of vertically split casting and large sizes of horizontally split casing as specified in the Schedule of Equipment.

The pumps to be volute type, cast iron body, fully bronze fitted, bronze impeller of radial type with double curvature vanes, stainless steel shaft or shaft sleeve, properly lubricated bearings, readily accessible stuffing box with packing and seal cage, flanged

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suction for the pump and the motor and the pump shafts covered with approved guard, pump casing to be complete to be completed with drain and vent plugs and designed, tested and proven tight for a test pressure at least equal to 1.5 times the maximum working pressure.

The pumps shall be to have the gate valves and strainers on the suction side, globe valves on the discharge side and pressure gauges on suction and discharge sides. If pumps are operating in parallel then a check valve to be installed on the discharge side of each pump.

The pumps shall be direct driven by a constant speed motor and provided with a suitable starter. The pump motor HP has been given for each system for guidance but it is intended that motor of higher HP shall be provided if required to ensure that it is not overloaded under any possible operating conditions of the pump.

Each pump shall be guaranteed for circulating the specified water quantity against specified net discharge head under the specified conditions of operation when operating continuously without overheating the motor, bearings, etc. However, the CONTRACTOR will check and confirm the actual discharge head required before placing orders for the pumps.

The pump shall be selected for quiet operation so that pump noise is not audible outside the plant room. The pump sound shall not be transmitted to the Building Structure.

The pumps installed for one system should be suitable for parallel operation in all respects. The pump impeller and motor should be so selected that these are not overloaded when only one pump is operating and increased water flow is to be handled due to reduced system head.

The CONTRACTOR shall supply anti-vibration foundation material (Both pads for isolator of main foundation and spring mountings for inertia mass) for isolating the pump foundations from the Building structure.

The number, size and conditions of operation for pumps required for different systems are specified in the Schedule of Equipment and the pumps location shown in the drawings.

Certified performance data and curves shall be submitted by the CONTRACTOR for approval to confirming the purchase order on the manufacturer/supplier.

The Tender to give following information for the pump:

- a. Pump capacity in USgpm against net discharge head, RPM, HP of motor, and pump maximum HP requirement.
- b. Construction and other technical details.
- c. Overall dimensions and operating weight.
- d. Manufacturer's Performance Guarantee Certificate and performance data and curves and technical bulletin.

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The sewage ejector submersible centrifugal pump motor sets shall be vertical heavy duty industrial type with non-clogging impeller suitable for continuous operation. The pump capacity rating shall be as specified in the Schedule of Equipment.

The pump shall be vertical single entry single stage non self-priming. The pumps casting shall be radically split open towards the discharge end sealed off by a cover, suction end with a renewable wear plate and nozzle, impeller suitable for mixture of contaminated fluids, solid particles and sedges. The shaft length shall suit the installation depth shown in the drawings and shaft pieces joined together by threaded shaft coupling. The weight of the rotor and axial thrust will be absorbed by deep groove ball bearing in the vertical hollow shaft motor. A grease pump mounted on the pump mounting plate shall continuously feed grease individually to every bearing during pump operation. The pump shall be fitted with soft packet stuffing box fed with sealing grease. The pump base plate shall be sized large enough to enable the pump to be pulled out/lowered into the pit without the necessity of enlarged pit roof opening. The pump discharge line will be terminated above the base plate. The wear plate shall be of cast iron, shaft protecting sleeve of stainless steel, shaft of carbon steel, base plate of steel, motor stool of steel/cast iron and bearing of lead bronze.

The pump motor sets to be of local manufacture, KSB type KVP or approved equal.

Level Controllers:

Each group of the above pumps shall have a control system as detailed below:-

A three position level controller shall automatically control the pump operation. The level controller shall start the pump at high level and stop the same at low level. At highest level, the level controller shall energize an audio-video alarm.

2.3.5 Unions:

Provide accessible unions in supply and return connections at all equipment fixtures, fixtures, specialists automatic valves, screwed end valves and at all other points in the system where required, in order to facilitate removal of specialties of equipment for repairs.

2.3.6 Expansion Joints for C.I. Soil or Waste Pipe:

Expansion joint in C.I. soil or waste pipe shall be provided as per plans, where the pipe crosses building expansion joint. These will be of non-pressure type, similar to imported Jossam Series.

2.4 MEASUREMENT:

Measurement shall be made for the number of fixtures and toilet accessories acceptably provided and fixed in position.

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2.5 RATE AND PAYMENT:

Payment shall be made for the number measured as provided above at the contract unit rate for the respective items in the Bill of Quantities and shall constitute full compensation for all labour, material, use of equipment and tools required for work related to the item including providing and fixing all other work to complete. The item in all respects as specified or as directed by the Engineer.

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2.1 DESCRIPTION**2.1.1 Sewerage Pipes:**

All sewerage/drainage pipe work inside the houses and buildings and upto the connection to the trunk sewer shall be covered under this section. The pipes shall be UPVC as specified including soil, waste, vent and anti-siphonic pipes.

2.2 MATERIAL REQUIREMENTS:

All UPVC pipes shall conform to the specifications ISO 3633 & PS 3214 i/c fitting and as specified in this section.

UPVC Soil and Waste etc piping shall conform to ISO 3633 & PS 3214 or other equivalent specifications with solvent cement or rubber ring joints as specified.

2.3 SOIL, WASTE, VENT AND ANTI-SYPHONIC PIPES:

The pipes shall run exposed or embedded in wall and floors as specified or shown on drawings. Where embedding in walls or floors is required, the necessary instruction and route of pipe work shall be approved by the Engineer. Pipes running exposed on walls and ceiling shall be properly clamped with Hangers, supports and clamps for passage of pipes through masonry wall and RCC beams, slab and walls, pipe sleeves, shall be embedded and properly caulked and water proofed.

Horizontal soil and waste pipes unless otherwise specified shall be given a grade of 8.4 mm (1/4") and 3.2 mm (1/3") 1/ft. respectively. All main vertical soil stacks shall extend full size to above the roof line, except where otherwise indicated. The part of the soil stacks carried up as vent pipe shall not have any bend or angle except when unavoidable, in which case, the angle shall be as abuse as possible. The vent stack shall joint the soil stack at a point not less than 3 feet (900 mm) above the highest connection to the soil stack. Horizontal waste lines receiving the discharge from two or more fixtures on the first floor shall be provided with end vents, unless separate venting of fixtures is called for.

Changes in pipe size on soil, waste and drain lines shall be made with reducing fittings or recessed reducers. All changes in direction shall be made by the appropriate use of 45 degree Wyes, long or short sweep 3 mm to 1.5 mm bends etc. or equivalent fittings as approved. Single and double sanitary tees and quarter bends may be used in drainage lines only where the direction of flow is from horizontal to vertical. Short sweep not less than 75 mm (3") in diameter may be used where the change in direction of flow is either in plan or vertical to horizontal and may be used for making necessary offsets between the ceiling and the next floor above. The use of short sweep bends or fittings, where deemed necessary because of installation conditions, shall be subject to the approval of the Engineer.

Contractor shall provide offsets in the pipit where required or directed by the Engineer to avoid interference with other work, or to increase the headroom under piping, or to

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improve the appearance of the pipe work. Piping shall be installed in such a manner that will permit freedom of movement during expansion and contraction without causing the pipes to be warped and adequately insulated against noise transmission through pipe work in habitable rooms.

All piping shall be installed in such a manner as to prevent delay or interference with the work of others working in the same area. All openings & pipes shall be kept closed during construction working in the same plugs.

Slip joints shall be permitted only in trap seals or on the inlet side of the traps. Tucker or hub drainage fittings shall be used for mating union connections wherever practicable.

The use of long screws and bushing is prohibited.

Clean-out shall be of the same size as the pipe except that clean-out plugs larger than 100 mm (4") will not be required. Clean-out installed in connection with spigot and socket pipe shall consist of long sweep 1/4" bend or one or two 1/8" bends extended to any easily accessible place, or where indicated on the drawings. An extra heavy cast-brass ferrule or as specified with outer sunk trap screw cover shall be caulked into the hub of the fitting and shall be flush with the floor. In addition, clean-outs shall be provided at all changes of direction in excess of 45 degree, and at distance not exceeding 15 meter (50 feet) in horizontal drain lines larger than 100 mm (4"). Underground clean-outs shall be extended to an accessible location, to the surface of the floor above, or to grade, subject to approval of the Engineer. Panels and plates for access to clean-outs shall be provided.

Each fixture and piece of equipment, including floor drain, requiring connections to the drainage system shall be equipped with a trap. Traps are to be supplied with the fixtures. Each trap shall be placed as near to the fixtures as possible, and no fixture shall be double-trapped.

2.4 TESTING OF PIPELINES:

No work shall be covered over or surrounded with concrete until it has been inspected, tested and approved by the Engineer.

2.5 INSPECTION AND TESTING OF DISCHARGE PIPES:

Work should be inspected and tested during installation, care being taken that all work which is to be concealed is tested before it is finally enclosed. Final tests should be applied on completion of the installation both for soundness and performance. Normally, the air test is used for soundness, but if the water test is applied, it should be used only upto the level of the lowest sanitary appliance connected to the system and then only in new system.

When testing old systems, it may be necessary to limit the pressure applied because of shallow trap seals; the water test should not be used. Any defects revealed by the test should be made good and the test repeated until a satisfactory result is obtained.

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SECTION - 2A: SEWERAGE/UPVC PIPE

Reference should be made to Local Authority and other enforcing authority requirements, particularly where pipe work passes through areas where blockages and leaks cannot be detected. In general, sufficient access should be provided to enable complete systems to be tested.

Access points should be carefully sited to allow the entry of cleaning and testing equipment and consideration also be given to adjacent services. Traps and joints that are easily disconnected can be an advantage so additional access is required only under exceptional circumstances.

The discharge from urinals can give rise to heavy deposits, especially in hard water areas. Regular maintenance is therefore required and access should be provided so that all parts of the stack, branch, discharge pipe and trap can be readily cleaned. Where the vertical discharge pipe had a long connection to a manhole, access should be provided at ground floor near the foot of the stack.

In multi-storey domestic buildings, access should be provided at 3 storey intervals or less. In public and commercial buildings and more complex, drainage systems, access should be provided at each floor level.

The discharge from appliance produces pressure fluctuations and the system must be designed to retain adequate water seal in all traps under excessive working conditions. Pressure effects that occur may be due to self siphon age or positive pressure. It may be necessary to use a ventilating pipe to limit the pressure fluctuations in the system within the acceptable limits.

The effect of the flow of water from an appliance into a branch discharge pipe must be considered taking account of:

- a) The design of the appliance (funnel shaped appliances increase the possibility of self siphon age)
- b) The length, slope and diameter of the branch discharge pipe.

Seal losses produced by effluent flow down the discharge stack depend on:

- a) The flow load which in turn depends on the number of appliances connected and frequency of use.
- b) The diameter of the discharge stack.

Air Test:

An air test should apply a pressure equal to 3.8 mbar (38 mm) (50 mbar (50 mm) Scotland) water gauge and should remain constant for a period of not less than three minutes (five minutes Scotland). The water seals of all sanitary appliances which are installed should be fully charged and a test plug inserted into open ends of the pipe work to be tested, each plug being sealed with a small quantity of water. One testing plug

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one basin and one sink from the top floor of the building with any other appliances to be discharged on the floor immediately below.

Table : C9 Number of appliances to be discharged simultaneously for testing g stability of seals; Dwellings

Number of appliances of each kind on the stack	WC 9 litres	Number of appliances discharged simultaneously Wash Basin	Kitchen Sink
1-9	1	1	1
10-24	1	1	2
25-35	1	2	3
36-50	2	2	3
51-65	2	2	4

2.6 MEASUREMENT:

All pipe work shall be measured in running foot / meter of finished length. No wastage or length consumed in joints shall be measured for payment. Bend, Tee, Sockets, spigot and collars etc shall not be measured separately.

2.7 RATE AND PAYMENT:

The rate for all items under this section shall cover the cost of all materials, labour, tools, equipment and appliance and performing all operations for laying, fixing and jointing and all work as specified in accordance with drawings, bill of Quantities and as directed by the Engineer. Rate for pipe work shall also include making and repairing cut holes and chases in wall, floors and slabs etc. painting pipes, supports and accessories cleaning and clearing pipe lines and testing till approved by the Engineer.

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3.1 DESCRIPTION

3.1.1 Sewerage Pipes:

All sewerage/drainage pipe work inside the houses and buildings and upto the connection to the trunk sewer shall be covered under this section. The pipes shall be RCC or C.I. as specified including soil, waste, vent and anti-symphonic pipes.

3.2 MATERIAL REQUIREMENTS:

All RCC/C.I. pipes shall conform to the specifications referred to in Section "Materials" and as specified in this section.

UPVC Water piping shall conform to ISO 3633 & PS 3214 or other equivalent specifications with solvent cement or rubber ring joints as specified.

For Cast Iron Pipes, the joints shall be lead caulked. The packing material shall be pure jute, hemp or hemp yarn. All exposed C.I. pipes and fittings shall be painted with 2 coats of black enamel over one prime coat.

For RCC pipes the cement mortar to be used on joints shall be of 1:1 ratio or as per Plans along with rubber ring. Material specifications for sewerage and drainage shall be as follows:-

a) Cast Iron spun Pipe, socket and spigot (6' length)

○ Minimum Weights

Dia (in)	2	3	4	6
Weight (Lb.)	24.9	37	48	72.9

○ Test Pressure against leakage = 20 psi

b) Cast Iron Fittings

○ Minimum Weights (Lb.)

TABLE - (BENDS)

Fittings (Inches)	2	3	4	5
87 - 1/2 degree and 45 degree Bend with out access	6.8	11	15	24.9
87 - 1/2 degree and 45 degree bend with access	29.9	7	11.9	18
	29.9			

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SECTION - 3: SEWERAGE/ DRAINAGE WORK

TABLE (WYES & REDUCERS)

Fittings (Inches)	2x2	2x3	3x3	2x4	3x4	4x4
87 - 1/2 degree and 45 degree with out access	9	15	16	17	20	24
87 - 1/2 degree and 45 degree Why with access	11	16	18	20	24	26
Eccentric Reducer with smaller side socketted.	-	7.9	-	11	11	-

c) R.C.C.Pipe

- BSS 556 : Class - M < 9"
- 6" dia pipe with collar
- 9" pipe, spigot and socket
- ASTM C76-72-a > 12"

3.2.1 CAST IRON FLOOR TRAP, MANHOLE FRAMES AND COVER, GRATING:

These shall be cast from a mixture of cast iron scrap and suitable grade of pig-iron. and resultant metal shall be of strong grey structure, free from chips, air bubbles and sand holes and shall be smooth and even both inside and outside.

3.2.2 Grease Trap:

Grease Trap shall be made of cast iron, for specified flow capacity and inlet/outlet dia and provided where shown on plans. Grease trap shall be embedded in raised floor and inlet shall be submerged.

3.2.3 Glazed Earthen Ware:

Shall be best and approved quality and the water seal shall not be less than 63.5 mm (2-1/2") deep.

3.3 CONSTRUCTION REQUIREMENTS:

3.3.1 Laying of RCC Pipe:

--Pipes and accessories shall be carefully examined before being laid and defective damaged pipes shall not be used. The pipes shall be brushed clean inside and outside

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SECTION - 3: SEWERAGE/ DRAINAGE WORK

to remove any soil or foreign matter that may have accumulated, including inside of the sockets and outside of spigots, before being lowered into the trench and shall be kept clean during laying operation by plugging or other approved method.

The bottom of the trench shall be shaped to give substantially uniform circumferential support to the lower fourth of each pipe. Pipe laying shall proceed upgrade with the spigot ends of bell and spigot pipe pointing in the direction of flow. Each pipe shall be laid true to line and grade and in such manner as to form close concentric joint with the adjoining pipe. If the width of the trench at the pipe is exceeded than necessary, due to any reason other than under direction from Engineer, the Contractor shall install at no additional cost to the Owner, such concrete casing pipe encasement or other bedding as may be required to satisfactorily support the added load of the backfill.

Trenches shall be kept free from water until the pipe jointing material has set, and pipe shall not be laid when the condition of the trench or the weather condition is unsuitable for such work. At time when work is not in progress, open ends of pipe and fittings shall be securely and satisfactorily closed so that no trench water, earth, or other substance will enter the pipe and fittings.

As the work progresses, the interior of the sewer shall be cleaned of all dirt and superfluous materials of every description. Where cleaning after laying is difficult because of small pipe size, a suitable swab or drag shall be kept in the pipe and pulled forward past each joint immediately after the jointing has been completed.

Where sewers cross above water line the sewer pipe for a distance of 3 meter (10 feet) each side of the crossing shall be of cast iron steel or other acceptable pressure pipe and with no joint closer than 3 feet (900 mm) to the crossing, or shall be fully encased in concrete of min. 15 cm. (6") thickness.

Any section of the pipe found to be defective before and after laying, shall be replaced with sound pipe without additional expense to the Owner.

The jointing of pipes with collars shall be done first with spun yarn rope (dipped in hot maphalt composition) fitted in between the ends of pipes and pressed together. The dia of rope shall not exceed 19 mm (3/1") or as joint. Wooden wedges uniform gap all round the pipe for pressing pipes together. At a time five or six pipes shall be jointed together. After putting bitumen soaked hemp rope, suitable jacks and wedges or any other approved method shall be used. The inside of the collar and outside portion of the pipe shall be cleaned with brush and cement of 1:1 proportion shall then be inserted from both ends of the collar. The mortar containing as little quantity of water as possible shall be carefully inserted by hand into the joints and tightly pressed with caulking tool. The mortar shall be finished off on the outside at an angle of 45 degree. The wooden wedges shall be carefully removed and mortar filled in the cavity before finishing. The joints shall be protected from weather and maintained wet for at least ten days and shall not be covered with backfill until the joints have been tested and approval given by the Engineers.

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For jointing of pipes with spigot and socket joints, the first pipe shall be bedded with the socket end upstream. The interior surface of the socket shall be carefully cleaned with a wet brush and its lower portion filled with mortar to such a depth as to bring together the inner surfaces of the abutting pipes flush and even. All further joints shall be made in this manner. The remainder of the socket joint shall be filled in with mortar and well pressed with the help of caulking tool. The mortar shall be finished smooth on the outside at an angle of 85 degree. The joints shall be protected and cured as for collar joints.

3.4 SOIL, WASTE, VENT AND ANTI-SYPHONIC PIPES:

Examination and preparation of pipes shall be as for RCC pipes.

The pipes shall run exposed or embedded in wall and floors as specified or shown on drawings. Where embedding in walls or floors is required, the necessary instruction and route of pipe work shall be approved by the Engineer. Pipes running exposed on walls and ceiling shall be properly clamped with Hangers, supports and clamps for passage of pipes through masonry wall and RCC beams, slab and walls, pipe sleeves shall be embedded and properly caulked and water proofed.

Horizontal soil and waste pipes unless otherwise specified shall be given a grade of 6.4 mm (1/4") and 3.2 mm (1/32") 1/ft. respectively. All main vertical soil stacks shall extend full size to above the roof line, except where otherwise indicated. The part of the soil stacks carried up as vent pipe shall not have any bend or angle except when unavoidable, in which case, the angle shall be as abuse as possible. The vent stack shall joint the soil stack at a point not less than 3 feet (900 mm) above the highest connection to the soil stack. Horizontal waste lines receiving the discharge from two or more fixtures on the first floor shall be provided with end vents, unless separate venting of fixtures is called for.

Changes in pipe size on soil, waste and drain lines shall be made with reducing fittings or recessed reducers. All changes in direction shall be made by the appropriate use of 45 degree Wyes, long or short sweep 3 mm to 1.5 mm bends etc. or equivalent fittings as approved. Single and double sanitary tees and quarter bends may be used in drainage lines only where the direction of flow is from horizontal to vertical. Short sweep not less than 75 mm (3") in diameter may be used where the change in direction of flow is either in plan or vertical to horizontal and may be used for making necessary offsets between the ceiling and the next floor above. The use of short sweep bends or fittings, where deemed necessary because of installation conditions, shall be subject to the approval of the Engineer.

Contractor shall provide offsets in the pipit where required or directed by the Engineer to avoid interference with other work, or to increase the headroom under piping, or to improve the appearance of the pipe work. Piping shall be installed in such a manner that will permit freedom of movement during expansion and contraction without causing the pipes to be warped and adequately insulated against noise transmission through pipe work in habitable rooms.

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3.6 TESTING OF PIPELINES:

No work shall be covered over or surrounded with concrete until it has been inspected, tested and approved by the Engineer.

3.7 INSPECTION AND TESTING OF DISCHARGE PIPES:

Work should be inspected and tested during installation, care being taken that all work which is to be concealed is tested before it is finally enclosed. Final tests should be applied on completion of the installation both for soundness and performance. Normally, the air test is used for soundness, but if the water test is applied, it should be used only upto the level of the lowest sanitary appliance connected to the system and then only in new system.

When testing old systems, it may be necessary to limit the pressure applied because of shallow trap seals; the water test should not be used. Any defects revealed by the test should be made good and the test repeated until a satisfactory result is obtained.

Reference should be made to Local Authority and other enforcing authority requirements, particularly where pipe work passes through areas where blockages and leaks cannot be detected. In general, sufficient access should be provided to enable complete systems to be tested.

Access points should be carefully sited to allow the entry of cleaning and testing equipment and consideration also be given to adjacent services. Traps and joints that are easily disconnected can be an advantage so additional access is required only under exceptional circumstances.

The discharge from urinals can give rise to heavy deposits, especially in hard water areas. Regular maintenance is therefore required and access should be provided so that all parts of the stack, branch, discharge pipe and trap can be readily cleaned. Where the vertical discharge pipe had a long connection to a manhole, access should be provided at ground floor near the foot of the stack.

In multi-storey domestic buildings, access should be provided at 3 storey intervals or less. In public and commercial buildings and more complex, drainage systems, access should be provided at each floor level.

The discharge from appliance produces pressure fluctuations and the system must be designed to retain adequate water seal in all traps under excessive working conditions. Pressure effects that occur may be due to self siphon age or positive pressure. It may be necessary to use a ventilating pipe to limit the pressure fluctuations in the system within the acceptable limits.

The effect of the flow of water from an appliance into a branch discharge pipe must be considered taking account of:

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appliances to be discharged simultaneously to simulate these conditions should be estimated from the figures given in Table C9 the expected service conditions.

Dwellings:

To test for the effect of self siphonage, waste appliances should be filled to over flowing level and discharged in the normally way. The seal remaining in the trap should be measured when the discharge is finished.

To test for the effects of probable maximum simultaneous discharges of sanitary appliances, the number of appliances to be discharged together is given in Table C9. For the purpose of this test, baths are ignored as their use is spread over a period and they do not normally add materially to the peak flow.

Where a stack services baths only, the number to be discharged simultaneously in a test should be the same as for sinks. The worst conditions occur when appliances on the upper floors are discharged. A reasonable test therefore is to discharge up to one WC, one basin and one sink from the top floor of the building with any other appliances to be discharged on the floor immediately below.

Table: C9 Number of appliances to be discharged simultaneously for testing stability of seals; Dwellings

Number of appliances of each kind on the stack	WC 9 litres	Number of appliances discharged simultaneously Wash Basin	Kitchen Sink
1-9	1	1	1
10-24	1	1	2
25-35	1	2	3
36-50	2	2	3
51-65	2	2	4

RCC pipes below 300 mm dia shall conform to B.S. 5911 Class-C and dia 300 mm or above to ASTM C-76-88.

3.8 MEASUREMENT:

All pipe work shall be measured in running foot of finished length. No wastage or length consumed in joints shall be measured for payment. Sockets, spigot and RCC collars shall not be measured separately.

For cast iron pipe line the length consumed in valves, fittings and specials shall be measured along with pipe line.

Cast Iron specials and fittings such as Tees, tapers, Bends, Shoes, Crosses, Offsets, flanged sockets and spigot, plugs and caps etc. shall be measured along with the pipeline.

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3.9 RATE AND PAYMENT:

The rate for all items under this section shall cover the cost of all materials, labour, tools, equipment and appliance and performing all operations for laying, fixing and jointing and all work as specified in accordance with drawings, bill of Quantities and as directed by the Engineer. Rate for pipe work shall also include making and repairing cut holes and chases in wall, floors and slabs etc. painting pipes, supports and accessories cleaning and clearing pipe lines and testing till approved by the Engineer.

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4.1 DESCRIPTION:

The work consists of constructing manholes for sewerage of positions shown on the plans or where otherwise directed by the Engineer and in accordance with the detailed drawings supplied from time to time, complete in all respects.

4.2 MATERIAL REQUIREMENTS:

Brick masonry, Portland cement concrete, and other materials shall meet the specified requirement of the relevant sections of the specifications for RCC given Sections "Portland Cement Concrete" Manhole steps shall be of mild steel as shown on the drawings.

4.3 CONSTRUCTION REQUIREMENTS:

Manholes shall be constructed with brick masonry of specified wall thickness laid in 1:4 sand cement mortar and R.C.C. concrete slab. The cover slab shall be Class-C reinforced cement concrete, fitted with cast iron frame which shall have weight $\frac{1}{2}$ CWT 18" (450 mm) diameter cast iron cover as shown in the plan. The inside of the walls shall be plastered with 1:4 sand cement mortar. At the bottom of manholes for sewers a proper channel as per drawings, shall be constructed in the whole length of the manhole along the centerline of the sewers to lead the swage from one sewer to the other. Mild Steel bar steps shall be installed inside the manhole, during the construction of the manhole walls. Cutting holes into the wall for the steps after construction will not be permitted. Top rung shall be 18" (450 mm) below the manhole cover and the lowest not more than 12" (300 mm) above the benching (Floor). Manholes shall have cement concrete Class-C benching as per drawings/specs. Manholes shall be connected with the nearby sewerage manholes through a reinforced cement concrete pipe as per details provided. Manholes along the central and primary drains shall also act as over-flow structures. The existing over-flow pipes shall be securely connected with these manholes.

4.4 MEASUREMENT:

Measurement shall be made for the actual number of manholes as shown in BOQs of the appropriate type constructed at site as per drawings and specifications laid down in this section and to the approval of the Engineer.

4.5 RATE AND PAYMENT:

The unit rate quoted in the priced Bill of Quantities for the construction of manholes shall be considered full compensation to cover the cost of all materials including framework and concrete, brick masonry, excavation, backfilling, steps frame and cover, and connecting pipe with the manhole, and all labour including curing, plastering, trenching, etc. and all incidentals to completely construct them at site, as per drawings and specifications laid down in this section.

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5.1 DESCRIPTION:

The work under this section consists of all drainage work and related items necessary to complete the work indicated on the drawings and described in the specifications. The work includes but is not limited to the following:-

- 1- All storm water drainage piping shall be C.I. or PVC within and RCC outside building as shown on the plans with connections to catch pits and open drains plus all related items to complete the work.
- 2- Provide all catch pits wherever shown on the drawings with C.I. Grating and hinged grating (if required).
- 3- Provide C.I. grating at the roof inlet of all vertical rain water drop pipes, as shown on the plans.
- 4- Gravel bedding shall be provided wherever called for on the drawings or directed by the Engineer.
- 5- Testing cleaning, adjusting and placing in operation all piping installed.
- 6- Pipe culverts of sizes indicated on the drawings.

5.2 MATERIALS:

Materials for C.I. and RCC pipe shall conform to the respective specifications specified under Section 3.2. The PVC pipe shall conform to the requirements of BSS 3505, Class-B, for which the working pressure shall be 87 psi minimum. The PVC pipes used shall be with integral parallel socket and shall be joined by solvent welding method.

5.3 CONSTRUCTION REQUIREMENTS:

Construction Requirements of pipe work shall meet the relevant specifications appearing else-where in the documents.

5.3.1 Protection of Works:

The installation shall be adequately protected against damage and deterioration particular care must be taken during the course of construction of seal all open ends of pipe work with a temporary cover. Wood shavings or paper will not be accepted for this purpose.

5.3.2 Concreting of Pipes:

Catch pits shall be constructed of brick masonry with Plain Cement Concrete Class-D base of 4" thick. Catch pit shall be of the dimensions indicated on the drawings. Cast iron frame and grating shall be provided as indicated on the drawing directed by the Engineer.

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SECTION - 6: EXCAVATION FOR WATER SUPPLY LINES & APPURTENANCES

6.1 DESCRIPTION:

The work covered by this section of the specifications consists of furnishing all plant, labour, equipment, appliances, and materials and performing all operations in connection with excavations, trenching and back filling for water lines and appurtenances in strict accordance with this section of the specifications and the applicable drawings, and subject to the terms and conditions of the contract.

6.2 CLEARING AND GRUBBING:

The sites of all excavations shall be cleared of all shrubs, plants, bushes, large roots, rubbish and other surface materials. All such materials shall be removed and disposed off in a manner satisfactory to the Engineer. All trees and shrubbery that are designated by the Engineer to remain shall be adequately protected and preserved in an approved manner.

6.3 EXCAVATION:

6.3.1 General:

All excavation of whatever substance encountered shall be performed to the depths indicated or as otherwise specified. During excavation, material suitable for backfilling shall be stockpiled in an orderly manner at a sufficient distance from the banks of the excavation to avoid overloading and to prevent sides from caving. All excavated material unsuitable or not required for backfill shall be removed and wasted at a location approved by the Engineer. Excavation in the streets shall be done in such a manner that street passage is not blocked by excavated material. Grading shall be done as may be necessary to prevent surface water from flowing into trenches or other excavations, and any water accumulated therein shall be removed by pumping or by other approved methods. Unless otherwise indicated or approved by the Engineer, excavation shall be open cut.

6.3.2 Trench Excavation:

Unless otherwise directed or permitted by the Engineer not more than 50% of any trench in advance of the end of the pipeline already laid shall be opened at any time, unless otherwise directed or permitted by the Engineer not more than 1000 ft. of any one trench shall be worked on at a time from removal of pavement bottom, not exceeding 6 feet in depth shall be a maximum of 20 inches plus the external diameter of the pipe barrel and the width of the trench exceeding 6 feet in depth shall be maximum 30" plus external diameter of the pipe barrel. The banks of the pipe trench shall be as nearly vertical as practicable. Bell holes and depressions for joints shall rest on the prepared bottom for its full length. Bell holes and depressions shall be only of such length, depth, and width as required for properly making the particular type of joints. Stones shall be removed to avoid point bearing. Whenever wet or otherwise unstable material that is incapable of properly supporting the pipe as determined by the Engineer is encountered in the bottom of the trench, such material shall be removed to the depth required and the trench backfilled to the proper grade with coarse sand, or other suitable approved granular

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SECTION - 6: EXCAVATION FOR WATER SUPPLY LINES & APPURTENANCES

material. Such replacement of unsuitable material shall be paid for at the contract unit price for that item of work. trenches shall be of a depth to provide a maximum cover, over the top of the pipe, of 30" from the existing ground surface or finished grade whichever is closer except that trenches for pipe laid in lanes and alleys of narrow traveled way (average width of 8 feet) or less between structures) shall be of a depth to provide a minimum cover, over the top of the pipe, of 18" from the existing ground surface or finished grade whichever is closer.

6.3.3 Excavation for Appurtenances:

Excavation for appurtenances shall be sufficient to leave at least 12" but not more than 24" between the outer surface and the embankment or timber that may be used to hold and protect the banks, any over-depth excavation below such appurtenances that has not been directed the Engineer will be considered unauthorized and shall be refilled with compacted sand gravel or concrete, as directed by the Engineer at no additional cost to the Owner.

6.3.4 Maintenance of Excavation:

All excavation shall be properly maintained while they are open and exposed. Sufficient suitable barricades, warning lights, flood lights, signs, and similar items shall be provided by the Contractor. The Contractor shall be responsible for any damage due to this negligence.

6.3.5 Removal of Water:

The Contractor shall build all drains and do ditching, pumping, well pointing, bailing, and all other work necessary to keep the excavation clear of ground water, sewage and storm water during the progress of the work and until the finished work is safe from injury. All water pumped or drained from the work shall be disposed of in a manner satisfactory to the Engineer and necessary precautions against flooding shall be taken.

6.3.6 Sheeting and Bracing:

If ordinary open-cut excavation is not possible or advisable, sheeting and bracing shall be finished to the work and to provide working conditions which are safe. The Contractor shall furnish and place all sheeting, shoring, wall braces, timbers and similar items, necessary for the safety of the work, the general public and adjacent property. Sheeting shoring and bracing shall be removed as the working progresses and in such a manner as to prevent damage to finished work and adjacent structures and property. As soon as withdrawn, all voids left by the sheeting and bracing shall be carefully filled with sand and compacted. The Contractor shall be fully responsible for the safety of work in progress, for the finished work; the workmen, the public and adjacent property.

6.3.7 Protection of Facilities:

Existing subsurface facilities likely to be encountered during the execution of work require special precaution for the protection, such as sewers, drain pipes, water main,

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SECTION - 6: EXCAVATION FOR WATER SUPPLY LINES & APPURTENANCES

conduits and electric cables and the foundations of adjacent structures. The Contractor shall be responsible for the damage of any such facility and shall repair the same at his expense whether or not this facility has been shown on the drawings.

6.3.8. Surplus Materials:

All surplus materials shall be disposed off at locations approved by the Engineer disposal of surplus material shall not interfere with other works and shall not damage or spoil other material. When it is necessary to haul earth or the material over street or payment, the Contractor shall prevent such material from on the street or payment.

6.3.9 Cutting Payment:

In cutting or breaking street surfacing, the contractor shall not use equipment which will damage the adjacent payment. Existing paved surfaces shall be cut back beyond the edges of the trenches to form neat square cuts. The road ballast, brick pavement, and other materials shall be placed on one side and shall be preserved for reinstatement when the trench is filled. Wherever necessary or required for the convenience of the public or individual residents, at street crossings and at private driveways, the Contractor shall provide suitable temporary bridges over unfilled excavations. All such bridges shall be maintained in service until backfilling has been completed. The Contractor shall keep the road crossings manned 24 hours per day. During night time, enough red lights shall be provided to warn traffic. If detour is necessary, the Contractor shall make proper detour for the traffic and shall be install signs 3feet by 4 feet in size indicated the detour.

6.4 BACKFILLING:

The trenches shall not be completely backfilled until all required pressure tests are performed and until the water lines as installed conform to the requirements of specifications. Where in the opinion of the Engineer, damage is likely to result from withdrawing sheeting, shoring the same shall be left in place and cut off at a level 12" below ground surface. Trenches shall be backfilled to the ground surface with selected excavated material or other material that is suitable for proper compaction. Trenches improperly backfilled shall be reopened to the depth required for proper compaction, then refilled and compacted to the specified density. The surface shall be restored to be original or better condition. Pavement and base course disturbed by trenching operations shall be required.

6.4.1. Lower Portion of Trench:

Backfill material shall be deposited in 6" maximum thickness layers and compacted with suitable and hand tampers to ninety five percent of maximum density until there is a cover of not less than 12" over the water lines. The backfill material in this portion of trench shall consist of sandy clay or other approved materials free from stones and humps.

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6.4.2 Remaining of Trench:

The remainder of the trench shall be backfilled with material that is free from stones larger than 6" in any dimension. Backfill material shall be compacted to 90 percent of maximum density for cohesive soils and 95 percent of maximum density for others.

6.5 BORROW:

Where suitable material for backfill is not available in sufficient quantity from required excavations, suitable material shall be obtained from approved sources at the contractor's responsibility. The necessary clearing and grubbing or borrow areas disposal and burring of debris therefrom the developing of sources including ay access roads for hauling and the necessary right-of-way, and the satisfactory drainage of the borrow shall be considered as incidental items to be borrow excavation.

6.6 GRADING:

After completion of all backfilling operations, the Contractor shall grade the work areas to he lines, grades and elevation shown on the drawings. Finished grading shall not be done until the installation of all water lines has been completed and tested. The top surface after completion shall be "in level" to the adjacent existing surface. Prior to final acceptance all damage due to settlement shall be repaired by and at the expense of the Contractor.

6.7 TESTING DENSITY OF SOIL IN PLACE:

The Engineer may make tests using the calibrated sand cone method/core cutter method to determine the density of soil in place. If soil in place fails to meet the specified degree of compaction the areas represented by the failing tests shall be removed, replaced and compacted to the specified density in the manner directed by the Engineer and at no additional cost to the Owner.

6.8 MEASUREMENT:

The measurement shall be made for the actual quantity of the work dines in cubic feet. The maximum width of the trenches allowed fro payment for various pipe sizes will be as under:-

- a) Upto 2" diameter pipe, the trench width will be 15"
- b) Upto 3" diameter pipe, the trench width will be 18"
- c) Upto 4" diameter pipe, the trench width will be 18"
- d) Upto 6" diameter pipe, the trench width will be 21"
- e) Upto 8" diameter pipe, the trench width will be 24"
- f) Upto 10" diameter pipe, the trench width will be 26"
- g) Upto 12" diameter pipe, the trench width will be 28"
- h) Upto 16" diameter pipe, the trench width will be 32"

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SECTION – 6: EXCAVATION FOR WATER SUPPLY LINES & APPURTENANCES

6.9 RATE:

The unit rate tendered in the priced Bill of Quantities for excavation of trenches for water supply lines shall be considered as full compensation for the work specified in this section and shall include constructing and removing of all temporary arrangements pumping and dewatering, removal of soft soil from bottom of trenches, removing the surface material and all incidentals to complete this work.

6.10 PAYMENT:

Payment shall be made for this item of work at the unit rate quoted in the priced Bill of Quantities.

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7.1 DESCRIPTION:

Work under this section shall consist of furnishing all materials, equipment and labour for excavation, trenching and backfilling for sewers, drainage facilities, structures and all other appurtenances of sewage collection system, in accordance with drawings to proper line and grade refilling the trenches and dressing them to proper surface.

7.2 CLEARING AND GRUBBING:

The sites of all excavations shall be cleared of all shrubs, plants, bushes, large roots, rubbish and other surface material. All such materials shall be removed and disposed of in a manner satisfactory to the Engineer all trees and shrubbery, that are designated by the preserved in an approved manner.

7.3 EXCAVATION:**7.3.1 General:**

The Contractor shall do all excavation of whatever substance encountered to the depth shown on the drawings or as otherwise specified. Excavation shall include without classification the removal and disposal of all material of whatever nature that would interfere with the proper construction and completion of the work and shall include the furnishing, placing and maintenance of supports for the sides of the excavations. The work shall also include all pumping, ditching, dewatering and other measures required for the removal and exclusion of water. During excavation, material suitable for backfilling shall be stock-piled in an orderly manner at a sufficient distance from the bank of the excavation to avoid over-loading and to prevent sides from caving. Top soil should be stockpiled separately for subsequent reuse as necessary. All excavated material unsuitable or not required for backfilling shall be removed and disposed of at a location approved by the Engineer.

For contract purposes hereunder, the earth excavation work has been classified into two categories, earth excavation in trenches, and earth excavation for structures.

7.3.2 Earth Excavation in Trenches:

Except as otherwise provided herein, excavation for a sewer line shall be open cut trenches with vertical side and not more than 150 feet of any trench in advance of the end of the built sewer shall be opened at any time and unless written permission to the Contractor is given by the Engineer. The trench shall be excavation to its full depth to a distance permitted for the sewer to be laid. Trenches for sewer-lined and appurtenances shall be to the lines and grades shown on the drawing or as ordered in writing by the Engineer as necessary for the proper completion of the work. Bell holes and depressions for joints shall be dug after the trench bottom has been graded. The pipe except for joint shall rest on the prepared bottom for its full length. Bell holes and depressions shall be only of such length, depth and width as required for properly making the particular type of joint. Stones shall be removed to avoid point bearing.

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be used. Sight rails shall be secured to the posts by strong steel clamps to the approval of the Engineer and in such a manner that they shall be fixed as immovable, in relation to the correct lines and levels. All boning rods and sight rails shall have the centre line accurately marked thereon by a fine saw cut and shall be painted black and white to the requirements of the Engineer. All boning rods shall suitably be showed with iron. At least four separate sight rails shall always be maintained in correct level and alignment along the line of sewer at every place where construction work is proceeding and the alignment and level of the sight rails shall be checked by the level and line at least twice every day to ensure that no disturbance or interference of the alignment and level have taken place. Whenever required Contractor shall erect and maintain such additional sight rails as the Engineer shall direct. The Contractor shall, at all times, see that his workmen or other unauthorized persons are not allowed accidentally or otherwise, to tamper or interfere with sight rails or other alignment or level marks.

All bends and curves shall be set out mathematically in a manner approved by the Engineer and the Contractor shall provide and maintain for the purpose such additional sight rail posts and other wrought and rough timber work, steel wire and other articles as the Engineer shall require from time to time.

7.3.6 Sheeting and Bracing:

If ordinary open-cut excavation is not possible or advisable, sheeting and bracing shall be furnished and installed in excavation to prevent damage and delay to the work and to provide working conditions which are safe. The Contractor shall furnish and place all shoring, sheeting, walls braces, timbers and similar items necessary for the safety of work, the general public and adjacent property. Sheeting, shoring and walls bracing shall be removed as the work progresses and in such manner as to prevent damage to the finished work and adjacent structures and property. As soon as it is withdrawn all voids left by the sheeting and bracing shall be carefully filled with selected material and compacted. The Contractor shall be fully responsible for the safety of work in progress, for the finished work, the workmen, the public expenses, as part of the work under the excavation items and at no extra cost.

7.3.7 Dewatering of Trenches:

As part of the work under the excavation items and at no extra cost, the Contractor shall build up drains and do ditching, pumping, well-pointing, hailing and all other work necessary to keep the excavation clear of ground water, sewage and storm water during the progress of the work and until the finished work is safe from injury, the Contractor shall provide all necessary pumping equipment for the dewatering work as well as operating personal, maintenance, power etc. all at no extra cost. All water pumped or drained from the work shall be disposed of in a manner satisfactory to the Engineer. Necessary precautions against flooding shall be taken.

7.3.8 Maintenance of Excavations:

All excavation made hereunder shall be properly maintained while these are open and exposed. Sufficient suitable barricades, warning lights, signs and similar items shall be

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provided by the Contractor. The Contractor shall be responsible for any personal injury or property damage due to his negligence.

7.3.9 Protection of Existing Facilities:

The Contractor shall take special care of existing sub-surface facilities likely to be encountered during the excavation for their protection, such as sewers, drain pipes, water main conduits, electric cables, communication cables and the foundations of adjacent structures. The Contractor shall be responsible for any damage to any such facility and shall repair the same at his expense whether or not the facility has been shown on the drawing.

7.3.10 Disposal of Surplus Excavated Material:

All surplus material excavated by the Contractor shall be disposed of at locations approved by the Engineer. The disposal of surplus material shall not interfere with other works and shall not damage or spoil other materials. When it is necessary to haul earth material over streets or pavements, the Contractor shall prevent such material from falling on the streets or pavements.

7.4 BACKFILLING:

7.4.1 General:

After the completion of sewer line, drainage facilities foundations, walls and other structures below the elevation of the final grade all voids shall be backfilled with suitable materials specified below.

7.4.2 Backfilling for Structures:

Backfilling operations for structures shall be performed as part of the Contractor's work under the payment items for earth excavation and at no extra cost. Backfilling material for foundations, walls, and other structures shall consist of excavated soil which is free from stones and hard clods not larger than 3 inches in any dimension, and also free from trash, lumber and other debris. Backfill material shall have enough moisture for proper compaction and shall be compacted in an approved manner to 90 percent of maximum density for cohesive soils and 95 percent of maximum density for cohesion less soils. Backfill shall not be placed against foundation walls earlier than 4 days after placing of concrete or brick masonry.

7.4.3 Backfilling for Trenches:

After the sewers have been constructed and proved to be water tight as per direction of the Engineer the trench shall be backfilled. Utmost care shall be taken in doing this so that no damage shall be caused to the sewer and other underground utilities. After this has been laid the trench and other excavation shall be backfilled carefully in 6" layers with earth as approved by the Engineer, each layer being watered to assist in the compaction unless the Engineer shall otherwise direct.

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7.5. MAXIMUM DENSITY DETERMINATION FRO COMPACTED SOIL:

The maximum density of the soil shall be determined in accordance with the latest revision of "American Society for Testing Materials (ASTM) Standard D 1557 Density Relations of Soils, using 15 lbs. Rammer and 18 inches Drop".

7.5.1. Testing Density of Soil:

The Engineer may make tests using the calibrated sand cone method/core cutter method to determine the density of soil in place in accordance with ASTM Designation D 2558, latest revision. If soil in place fails to meet the specified degree of compaction the areas represented by the falling tests shall be re-excavated and compacted to the specified density in the manner directed by the Engineer at no extra cost.

7.5.2. Top Soil:

Top soil which has been stockpiled during excavation shall be used for the top 6" of backfill, in locations as ordered by the Engineer. Top soil shall be saturated with water and after it has dried, shall be spread to the required final grade and of required density. The work shall be performed at no extra cost.

7.5.3. Proximity to Buildings:

Where buildings in the opinion of the Engineer near excavation are likely to be affected, the Contractor shall provide proper shoring to protect such buildings in addition to timbering of trenches. The Contractor shall be required to leave timbering inside trenches if so required by the Engineer for protection of these buildings at no extra cost.

7.6. LENGTH OF TRENCHES IN ADVANCE OF CONSTRUCTION:

Unless otherwise directed in writing by Engineer of the work not more than 200 feet in advance of constructed or laid sewer shall be left open at any time. The trench shall, however, be excavated to full width to minimum length of 16 feet in advance of the constructed laid sewer unless otherwise directed by the Engineer.

7.7. DISPOSAL OF FILTH AND GARBAGE:

No night soil filth and garbage met with during the excavation shall be allowed to be deposited on side of road/street so as to cause nuisance or obstruction to traffic. The same shall be disposed of by the Contractor to a place to the satisfaction of the Engineer.

7.8. DISPOSAL OF SURPLUS EARTH:

The Contractor shall dispose of all surplus excavated materials not required to be used on the work. This shall include surplus earth after refilling and compaction.

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7.8 TUNNELING:**7.9.1 Formation of Soil:**

Tunneling shall only be permitted in strong hard and homogeneous, clay formation which are not likely to collapse under normal working conditions. The work shall not be permitted in running sand. In weaker formation such as mixture of clay and sand which are liable to collapse when exposed to atmosphere. The roof shall be protected by adequate timbering and shoring of roof and the walls, irrespective of any type of alluvial strata. If the tunnel is subject to any sort of traffic, it shall be provided with adequate timbering and shoring for its roof and walls.

7.9.2 Length of Tunnel:

Normally the length of tunnel without adequate support shall not exceed 3'. This length shall, however, may be exceeded under the directions of Engineer, where depth of tunnel below ground level is considerable to avoid any danger of collapse. The tunnel, however, shall be driven in longer lengths upto 150 feet, if drive casing is provided as the tunnel is being excavated.

7.9.3 Horizontal Boring Machines:

When considered necessary by the Engineer, horizontal boring machines shall be employed for crossing sewers underneath highways and canals. Whenever such machinery is used, drive casing of steel pipes shall be driven to avoid any collapse of the tunnel.

7.9.4 Backfilling of Tunnels:

Tunnels shall be filled in with sand or selected material as directed by the Project Manager.

7.10 MEASUREMENT:

Measurement shall be made for the actual quantity in 3' of excavated trenches. The maximum width of trenches allowed for payment will be as follows:-

- a) Trenches not exceeding 6 feet in depth 24" plus external diameter of the barrel for pipe sewers.
- b) Trenches exceeding 6 feet and not exceeding 12' in depth 30" plus external diameter of the barrel for pipe sewers.
- c) Trenches exceeding 12 in depth 36" plus external diameter of the barrel for pipe sewers.

7.11 RATE:

The unit rate tendered in the priced Bill of Quantities for excavation and back filling of trenches for sewer lines, shall be the full compensation for the cost materials, labour,

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SECTION - 7: EARTH WORK FOR SEWERS

equipment, tools and all incidentals necessary completely to execute this item of work strictly as per specifications laid down in this section.

7.12 PAYMENT:

Payment shall be made at the unit rate quoted in the priced Bill of Quantities.

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GENERAL

Wherever specifically called for by means of notes on the contract drawings or by written order of the Engineer the Contractor shall furnish and place sand or pea gravel bedding under water lines, sewer lines, drain pipes and other structures as a separate item of payment.

8.1 SOURCE OF BEDDING MATERIAL

Sand or pea gravel for bedding shall be from a source and of specifications approved by the Engineer.

8.2 PURITY AND STACKING

the sand and gravel shall be free from clay, salt, alkali, organic matter, shale, loam, soft flaky particles and other deleterious substance. It shall be stacked at the place designated by the Engineer and kept free from the admixture of deleterious materials mentioned herein.

8.3 PLACING OF BEDDING MATERIAL

The material for bedding shall be placed to the specified thickness and compacted by rammers of approved weight.

8.4 MEASUREMENT

the measurement shall be made by volume for the actual quantity of the work done and the unit of measurement shall be one cubic feet.

8.5 PAYMENT

Payment for this item of work shall be made for the actual quantity of work done as specified in this section, at the unit rate quoted in the priced Bill of Quantities.

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9.1 DESCRIPTION

The work covered by this section of the specifications consists in furnishing all labour, equipment, appliances and materials and in performing all operation in connection with cutting and restoration of road/street surface and pavement, cut or damaged as a result of work accomplished under this contract in strict accordance with this section of the Specifications and the applicable drawings and to the satisfaction of the Engineer.

9.2 CUTTING OF ROAD/STREET SURFACE AND PAVEMENT

In cutting and breaking road or street surface and pavement, the contractor shall not use such equipment and appliances which shall damage the adjacent surface. Existing paved surface shall be cut back beyond the edges of the trenches to form neat squares cuts. The dismantled materials shall be placed on one side of the trench for reuse after backfilling, for the restoration of the road surface. Not more than 500 feet of continuous road/street surface shall be out or disrupted at a time for laying the drains. The Contractor shall take all safety measures against traffic hazards and shall provide proper diversion for the traffic where necessary. The diversion shall be indicated by suitable street signs 3 feet by 4 feet in size. During night enough red lights shall be provided to warn the traffic.

9.3 CUTTING IN EXCESS OF THE WIDTH OF TRENCH

The cutting of the road/street surfaces and pavement shall be limited to the width of the trench. Where the contractor has cut the road surface or pavement in excess of the width of the trench he shall not be paid for the excess cutting and the excess cutting shall be restored by the contractor at his own expenses.

9.4 RESTORATION OF ROAD/STREET SURFACE AND PAVEMENT

After backfilling of trenches the cut road/street surface and pavement shall be restored as quickly as possible to original foundations and grade and line in such a manner as to acceptable surface for traffic. Intersections shall be restored within 24 hours after being cut.

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10.1 DESCRIPTION

The work covered by this section of the specification consists in furnishing all labour equipment appliances and materials and in performing all operation in connection with providing water, sewerage and drainage and gas connections to the existing lines.

This Section of the Specifications is intended to cover all miscellaneous items which are not specifically called for in other section of these specifications. Item shown or called for on the drawing, but not itemized herein, shall be furnished under the conditions of this sections and shall generally conform, as closely as possible to these specifications unless otherwise directed by the Engineer.

10.2 MATERIAL REQUIREMENT**10.2.1 Structural Steel**

For screen grating, & I-beam steel shall be carbon ASTM A-36, minimum strength of which shall be 36,000 psi. Except where otherwise shown all structural steel shapes and sizes shall be shown on the plans.

The bar steps in sewage lift station O/H, U/G Reservoir manholes shall be malleable iron steps (galvanized), designed with non-solid tread and shall comply with BS 1247/75. The steps shall be hot dipped galvanized with overall length, width, tread length and minimum weight of 10,6,5 lbs respectively.

10.3 CONSTRUCTION REQUIREMENT**10.3.1 Fabrication of Screen**

Screen and gratings for sewage lift stations shall be constructed in accordance with the details as shown on the Plans.

Metal shall be well formed to shape and size with sharp line or angles. Shearing and punching shall leave clean, true lines and surfaces. Permanent connections shall be welded. The use of screws or bolts shall be avoided but where used, heads shall be counter sunk screwed on-tight, and the threads nicked to prevent loosening. Necessary rabbits, lugs and brackets shall be provided so that work can be assembled in a neat and substantial manner. Thickness of metal and details of assembly and supports shall give ample strength and stiffness. All the work shall be installed in an approved and rigid manner, and where possible, shall be secured with galvanized bolts or welded where shown.

10.3.2 Painting

Screen surface shall receive one coat of rust inhibitive metal primer to red lead paint for which no separate payment shall be made to the contractor.

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10.3.3 Welding

Welding shall be continuous along entire line of Contract, except where spot welding is indicated on the drawings or is authorized by the Engineer. Exposed welds shall be ground smooth except otherwise directed by the Engineer.

10.3.4 Bolting

Bolting where permitted shall be done with proper size bolts. Nuts shall be drawn tight and threads nicked.

10.4. MEASUREMENT

Measurement for screen will be made for the actual work executed at the unit rate entered in the Bill of Quantities. Bar steps shall be measured per unit acceptable placed in the wall completed and approved. All connections to the specified lines. (i.e. water sewerage and drainage) shall be Lump sum.

10.5 RATE AND PAYMENT

Payment shall be made at the unit rate stated in the Bill of Quantities. Such payment shall constitute full compensation for furnishing all materials equipment and labour including testing and all other incidentals necessary to complete the work according to the applicable drawings and directions of the Engineer.

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SECTION - 11: WATER RETAINING STRUCTURE

11.1 DESCRIPTION

The work covered by the sections of specification & consist of construction of overhead. Underground water tanks and swimming pool.

11.2 MATERIAL REQUIREMENT

All materials such as cement, sand, aggregate & steel etc. shall conform to the specifications given in respective e section (Material) or given elsewhere.

11.3 CONSTRUCTION REQUIREMENT

The Contractor shall carry out the work according to design drawing/instructions of Engineer Incharge. Work shall include the following.

1. Columns/pillar raised/constructed upto required height RCC 1:1-1/2:3
2. Bed and side walls of tanks shall be constructed in RCC 1:1-1/2:3 mixed with puddle as per manufacturer's directions.
3. Inside of the tank shall be finished with 1/2" thick terrazzo over 1/2" thick 1:2 cement sand mortar or ceramic tiles as specified on drawings.
4. Roof slab shall be in RCC 1:2:4 with manhole cover with frame and vent pipes.
5. In joint water stopper 9" wide will be used.
6. For pipes, rising mains, delivery, overflow & washout, puddle collars of specified size will be fixed during pouring of side wall concrete.
7. Necessary gauge and float valve shall be provided.
8. Stairs shall be provided inside & outside the tanks as per plans
9. Inside of the tank will be lime washed for dis-infections.
10. If any where brick work is used, it will be 1st class brick work set in cement sand mortar 1:3
11. If any plaster is done that will be in cement sand mortar 1:3 with puddle
12. External sides of walls of under ground water tank will be provided vertical DPC as per specifications in section DPC.

11.4 MEASUREMENT

Measurement will be taken in capacity of water tank. For calculating capacity. Free board will not be accounted for i.e height. From bottom to water level will be taken.

11.5 RATE AND PAYMENT

Rate shall include all material form work & labour etc. complete in all respect design/drawing/instructions of Engineer In charge.

Signature _____

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Seal _____

**SHAHEED BENAZIR BHUTTO UNIVERSITY
SHERINGAL DIR UPPER
KHYBER PAKHTUNKHWA PAKISTAN.**

- **BUILDING ITEM:-** CONSTRUCTION OF MULTIPURPOSE HALL
- **PROJECT NAME:** “DEVELOPMENT OF UNIVERSITY OF DIR SHERINGAL”.
- **SPONSORING AGENCY:** HIGHER EDUCATION COMMISSION ISLAMABAD.
- **FUNDING AGENCY:** PLANNING COMMISSION OF PAKISTAN.

Engineer's Estimate

Bidding Doc Vol-III



ASSOCIATED CONSULTING ENGINEERS – ACE (PVT) LTD
Architectural and Town Planning Section
Ground Floor, 36-Civic Center, M-Block Model Town Extension, Lahore
Tel: (+9242) 35170871-74 Fax: (+9242) 35170875
Email: acearts@acepakistan.com, aceartslhr@gmail.com,
Web Site: www.acepakistan.com



BRANCH OFFICES
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ISO 9001 Certified



Project Director/Director of Works/
Director P & D
Shaheed Benazir Bhutto University
Sheringal Dir Upper

Summary of Bill of Quantities		
Construction of Multipurpose Hall at Shaheed BB University, Sheringal, Dir Upper		
Ser	Description of Works	Amount
1	(Schedule items) Priced on CSR/MRS 2017 Khyber Pakhtunkhwa.	
A.	Civil Works	Rs. 47,770,051/-
B.	Plumbing, Sanitary and Water Supply Works	Rs. 908,875/-
C.	Elect/Mechanical/Fire Alarm/Networking/CCTV Systems	Rs. 2,320,948/-
D.	Sub-Total of Serial 1. Schedule items (A+B+C)	Rs. 50,999,875/-
2	(Non-Schedule items)	
a.	Civil Works	Rs. 10,238,976/-
b.	Plumbing, Sanitary and Water Supply Works	Rs. 346,223/-
c.	Elect/Mechanical/Fire Alarm/Networking/CCTV Systems	Rs. 3,567,922/-
d.	Sub-Total of Serial 2. Schedule items (a+b+c)	Rs. 14,153,121/-
	Grand Total of Ser 1 & 2 (Schedule and Non-Schedule items)	Rs. 65,152,996/-
	Add/deduct \pm % over Total (by the Bidder) _____ % _____	Rs. _____/-
	Net Total	Rs. _____/-

We the undersigned offer to execute and complete such works and remedy any defect therein in conformity with the complete bidding/ contract documents (i-e Conditions of the Contract, GCC/PCC, Bill of Quantities/Engineer's Estimate alongwith preamble, Specifications (Technical & Special Provisions), Appendices, and Drawings within the Stipulated Period in the Quoted Rates by us.

Seal and Signature of the Bidder
M/S _____

Bill of Quantities						
Construction of Multipurpose Hall at Shaheed BB University, Sheringal, Dir Upper						
Sr. No.	Description	Qty	Unit	CSR/MRS Item No	Rate	Amount
1	2	3	4	5	6	7
A.	Civil Works (Schedule items)					
	Chapter-3 (Earthwork)					
1	Excavation as in Ordinary Soil in Foundation of Building and other structures as and where required/directed including refilling around foundation, plinth, under floor with surplus excavated earth, including watering, ramming, or disposing off of surplus material lead upto 50 meter, complete all as per Drawings, Specifications and Directions of the Engineer.	12135.61	Cft	03-23-b	6.075	Rs. 73,724/-
2	--ditto-- but in Hard Soil.	4045.20	Cft	03-23-c	6.806	Rs. 27,533/-
3	--ditto-- but in Shingle/Gravel.	4045.20	Cft	03-23-d	7.740	Rs. 31,310/-
4	Filling around Foundation, Plinth, under Floor or as and where required and directed by the Engineer with any type approved earth/filling material barrowed from the approved source, including excavation at source, transportation upto 50 meter, filling watering, ramming, complete all as per Drawings, Specifications and Directions of the Engineer.	49164.57	Cft	03-16-b	6.019	Rs. 295,909/-
5	Trasportation of earth any/all type/types lead upto 8 KM.	49164.57	Cft	03-17-a, 18-a,b,c (Pro)	18.844	Rs. 926,457/-
6	Sweet Earth/Clay filling in Lawns and Grounds including dressing and compaction with earth barrowed from approved sources lead upto 4 KM complete all as per Drawings, Specifications and Directions of the Engineer.	100.00	Cft	03-06-b	5.006	Rs. 501/-
7	Supplying and Turfing of lawn with Imported Dacca Grass as per approved sample all as per Drawings, Specifications and Directions of the Engineer.	100.00	Sft	03-53	18.388	Rs. 1,839/-
8	Supplying, Preparation and Spraying of anti-termite liquid mixed with water, spraying on excavation and spraying or injection on/in wood works as and where required/directed complete work all as per Drawings, Specifications and Directions of the Engineer.	24808.42	Sft	26-15	1.263	Rs. 31,323/-
	Chapter-4 (Dismantling)					
9	Dismantling of PCC or Stone or Brick Masonry laid in CM in any ratio or position, storey and of any size and disposing off to suitable site to as per directions of the Engineer.	8259.53	Cft	04-03	16.880	Rs. 139,421/-
10	Taking down and removing to store of CGI/PGI Sheets as in roofing including all accessories & fittings in any storey as per directions of the Engineer.	4058.00	Sft	04-28-b	6.440	Rs. 26,134/-
11	Taking down and removing to store of wooden Trusses including all accessories & fittings as per directions of the Engineer.	100.00	Kg	04-37-d (Pro)	9.760	Rs. 976/-
12	Taking down and removing to store of Door and Windows including all accessories & fittings as per directions of the Engineer.	40.00	No	04-35	202.500	Rs. 8,100/-
	Chapter-6 (Concrete)					
13	Plain Cement Concrete (using Crushed Stone) under foundation and under layers of floors, as and where required etc. including Placing, compacting, finishing & curing complete (including screening and washing of aggregates) (Ratio 1:4:8) complete all as per Drawings, Specifications and Directions of the Engineer.	2257.02	Cft	06-05-i	155.207	Rs. 350,306/-

Seal and Signature of the Bidder
M/S_____

Bill of Quantities						
Construction of Multipurpose Hall at Shaheed BB University, Sheringal, Dir Upper						
Sr. No.	Description	Qty	Unit	CSR/MRS Item No	Rate	Amount
1	2	3	4	5	6	7
14	--ditto--but using Ratio 1:2:4.	1642.64	Cft	06-05-f	205.519	Rs. 337,594/-
	Providing and laying Reinforced Cement Concrete using coarse sand and screened graded & washed aggregate (Crushed Stone), in required shape & design, including wooden forms, moulds, wooden shuttering, lifting, compacting, curing, rendering and finishing exposed surface, complete (but excluding cost of steel reinforcement, its fabrication and placing in position etc.) all as per Drawings, Specifications and Directions of the Engineer.					
15	RCC as in Roof Slab, Beams, Column, Lintels, Girders & other structural members, insitu or precast laid in position or prestressed members cast in situ, Type-B Concrete (minimum ratio 1:1.5:3) including form work complete all as per Drawings, Specifications and Directions of the Engineer.	12046.16	Cft	06-06-a-02	299.057	Rs. 3,602,483/-
16	RCC as in Slab of Raft/Strip Foundation, Base Slab of Columns and Retaining Walls and other structural members other than Columns, Beams, Slab, Lintels, Shades. Type-B Concrete (minimum ratio 1:1.5:3) complete but not requiring form work, all as per Drawings, Specifications and Directions of the Engineer.	6035.58	Cft	06-06-b-02	275.365	Rs. 1,661,989/-
17	Add extra labour for laying concrete (plain or reinforced) from 20ft upto 40ft height.	1110.00	Cft	06-12-a	22.500	Rs. 24,975/-
18	Supply & Fabrication of Mild Steel Reinforcement using Hot Rolled Deformed Bars Grade 40 for Cement Concrete, including cutting, bending, laying in position, making joints and fastening, including cost of binding wires and labour charges for binding of Steel Reinforcement (also includes removal of rust from bars) (overlaps, chairs, and wastage, shall not be measured & paid separately) all as per Drawings, Specifications and Directions of the Engineer.	10635.16	Kgs	06-07-c	107.564	Rs. 1,143,964/-
19	--ditto-- but deformed bars Gde-60.	53820.34	Kgs	06-07-b	111.599	Rs. 6,006,289/-
20	Plain Cement Concrete as and where required etc. including Placing, compacting, finishing & curing complete (less formwork) (Ratio 1:3:6 using 30% boulders) complete all as per Drawings, Specifications and Directions of the Engineer.	100.00	Cft	06-36-c	138.374	Rs. 13,837/-
21	Erection and removal of Steel Formwork for RCC or PCC.	5880.00	Sft	06-39-b	71.772	Rs. 422,019/-
22	Providing and laying of Damp Proof Course comprizing 2" thick PCC 1:2:4, two Coat of Bitumen applied hot and one layer of Ploythene sheet 500 gauge all as per Drawings, Specifications and Directions of the Engineer.	846.02	Sft	06-22-b-ii	66.850	Rs. 56,556/-
23	Providing and laying of Vertical Damp Proof Course Comprizing 3/4" thick Cement Sand Plaster (Ratio 1:2), one Coat of Bitumen and one Layer of Ploythene sheet 500 gauge all as per Drawings, Specifications and Directions of the Engineer.	800.89	Sft	6-24-a-v	40.618	Rs. 32,531/-
24	Supplying and Fixing in any position and any floor/storey/roof of PVC water stopper 8" wide and 3/8" thick complete all as per Drawings, Specifications and Directions of the Engineer.	256.00	Rft	24-40	134.350	Rs. 34,394/-
25	Supplying of Stone or Brick Ballast 1" to 2" as in under layer of Floors, Hard Standings, Roads or as and where directed, brought from approved source, including transportation and laying in position, watering, ramming, all as per Drawings, Specifications and Directions of the Engineer.	3800.38	Cft	06-02	33.784	Rs. 128,393/-
	Chapter -7 (Masonry Works)					
26	Pacca/Burnt Brick Work in Foundation, Plinth and anywhere below Ground Level in Cement, Sand Mortar Ratio 1:6 complete all as per Drawings, Specifications and Directions of the Engineer.	4106.31	Cft	07-04-a-05	219.838	Rs. 902,722/-
27	Pacca/Burnt brick work in Ground Floor in Cement, sand mortar Ratio 1:6 complete all as per Drawings, Specifications and Directions of the Engineer.	11585.01	Cft	07-05-a-05	235.985	Rs. 2,733,890/-

Seal and Signature of the Bidder
M/S _____

Bill of Quantities						
Construction of Multipurpose Hall at Shaheed BB University, Sheringal, Dir Upper						
Sr. No.	Description	Qty	Unit	CSR/MRS Item No	Rate	Amount
1	2	3	4	5	6	7
28	Pacca/ Burnt brick work in First Floor in Cement, Sand mortar Ratio 1:6 complete all as per Drawings, Specifications and Directions of the Engineer.	5814.74	Cft	07-05-a-05 07-06-a (Pro)	247.802	Rs. 1,440,900/-
29	Pacca/Burnt brick work in Ground Floor in Cement, sand mortar 1:4 complete all as per Drawings, Specifications and Directions of the Engineer.	843.85	Cft	07-05-a-03	244.178	Rs. 206,048/-
30	Supplying and Filling Sand as in under layer of Floors or as and where directed complete brought from approved source including, transportation and laying in position, all as per Drawings, Specifications and Directions of the Engineer.	4303.44	Cft	07-30	29.990	Rs. 129,060/-
Chapter-9 (Roofing, Trusses and Ceiling Works)						
31	Supplying and Fixing of 24 BWG Corrugated Galvanized Iron Sheet fixed to Timber/Steel Framing or Purlins with one and half Corrugation side lap and six inches end laps fixed with GI "J" Bolts, Nuts, or Nails, including GI Limpet and Bituminous Washer, @ 15" C/C, complete in all respect (but excluding cost of Valleys, ridges, wind ties), all as per Drawings, Specifications and Directions of the Engineer.	22406.00	Sft	09-13-c	117.156	Rs. 2,625,006/-
32	Supplying and Fixing of 24 BWG Plain Galvanized Iron Sheet fixed to Timber/Steel Framing or Purlins fixed with GI "J" Bolts, Nuts, or Nails, including GI Limpet and Bituminous Washer complete in all respect as in Ridges, Hips Valley, Covels etc. (but excluding cost of Valleys, ridges, wind ties) all as per Drawings, Specifications and Directions of the Engineer.	2100.00	Sft	09-18 (Pro)	144.498	Rs. 303,445/-
33	Supplying and fixing in position, Mild Steel Sections, Angles, Tees, Flat, Channels, Solid, Square, Solid Round Bars any size and thickness including Welding, Grinding as in Steel Trusses, i-e Purlins, Rafter, Struts, Kingpost, Wind Ties and Gussets plates and the like items etc. and/or where required/ directed/ shown in drawings complete work all as per Drawings, Specifications and Directions of the Engineer.	42000.00	Kg	25-10 25-11 (Pro)	147.070	Rs. 6,176,940/-
34	Supplying and fixing in position, Mild Steel Nut and Bolts and similar light weight items Galvanized, erected in concrete RCC for holding up roof trusses. and/or where required/ directed/ shown in drawings complete work all as per Drawings, Specifications and Directions of the Engineer.	5.00	Kg	25-09	154.563	Rs. 773/-
35	Supplying and fixing in position of 2nd class wood (kail, sruf, kachal, Chir, Partal, kandal, Garjan, etc.) as in trusses, kingpost, tie beams, rafter, strut, purlin, etc. or as and where required all as per Drawings, Specifications and Directions of the Engineer.	6.25	Cft	12-1-a/2 (Pro)	3,472.190	Rs. 21,701/-
36	Supplying, Making and Fixing in Position as per approved Design and Shape of 1/2" thick water proof Lasani Sheet (MDF) in Eave Board, Roof Ceiling and the like positions complete including framing 2"x1.5" unplanned @ 2'-0 C/C B/Ways all as per Drawings, Specifications and Directions of the Engineer.	10.00	Sft	12-37-a-03	211.167	Rs. 2,112/-
Chapter-10 (Flooring)						
37	Providing and laying of Ceramic Tiles 12"x12" any color and thickness as in dado/skirting/flooring jointed in white cement incl. finishing complete in all respect over 1/2" thick cement mortar 1:2 plaster or base (Emco, National or eq.), all as per Drawings, Specifications and Directions of the Engineer.	1292.69	Sft	10-46-a	165.076	Rs. 213,392/-
38	Providing and laying of Glazed tiles any color and 1/4" thick as in dado/skirting jointed in white/color cement/pigment complete in all respect over 3/4" thick cement mortar 1:4 wall plaster/base, all as per Drawings, Specifications and Directions of the Engineer.	5656.14	Sft	10-39	145.716	Rs. 824,190/-

Seal and Signature of the Bidder
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Bill of Quantities						
Construction of Multipurpose Hall at Shaheed BB University, Sheringal, Dir Upper						
Sr. No.	Description	Qty	Unit	CSR/MRS Item No	Rate	Amount
1	2	3	4	5	6	7
39	P&F 2" thick Precast Concrete 7000PSI Tuff Tiles any type and design, over 2" thick bed of sand over 4" thick Brick or stone ballast including Vibration of Tiles with plate vibrator, joints filled with sand, complete in all as per Drawings, Specifications and Directions of the Engineer.	5253.00	Sft	10-45	101.219	Rs. 531,701/-
40	Supplying and fixing/laying in position, Brick on Edge in flooring laid and Jointed in 1:6 in cement sand mortar over a bed of 3/4" thick cement sand mortar (1:6), all as per Drawings, Specifications and Directions of the Engineer.	2012.25	Sft	10-09	95.758	Rs. 192,689/-
41	Supplying and fixing/laying in position, 1" thick Shisham Wood Block flooring duly finished cut to required size, fixed with screws or nails on one layer of asphalt bitumen laid as base, all as per Drawings, Specifications and Directions of the Engineer.	4700.00	Sft	10-33	854.812	Rs. 4,017,616/-
Chapter-11 (Surface Rendering)						
42	3/8" thick Cement Plaster under soffit of RCC roof slabs (in CM 1:2) upto 20 ft hight, all as per Drawings, Specifications and Directions of the Engineer.	4358.82	Sft	11-10-a	23.830	Rs. 103,871/-
43	3/8" thick Cement Plaster under soffit of RCC roof slabs in any floor: (in CM 1:4) all as per Drawings, Specifications and Directions of the Engineer.	100.00	Sft	11-10-c	22.096	Rs. 2,210/-
44	1/2" thick Cement Plaster in CM 1:4 on walls upto 20 ft hight all as per Drawings, Specifications and Directions of the Engineer.	10230.26	Sft	11-9-b	20.240	Rs. 207,060/-
45	3/4" thick Cement Plaster in CM 1:4 on walls upto 20 ft hight all as per Drawings, Specifications and Directions of the Engineer.	10230.26	Sft	11-9-c	27.330	Rs. 279,593/-
46	Add extra for cement plaster from 20ft and above for each additional 10ft height or part thereof, all as per Drawings, Specifications and Directions of the Engineer.	8652.98	Sft	11-28	2.620	Rs. 22,671/-
Chapter-12 (Joinery Works)						
47	Supplying and fixing in position of First Class 1.75" thick deodar wood wrought joinery in doors/windows as per approved design fully paneled, or paneled & glazed, or fully glazed, both sides finished, including Glass, Chowkat, mongary/fittings i-e Holdfasts, Hinges, Tower Bolts, Handles, Chokes, Stopper, Cleats/ GI Clamp, and cord with hooks etc. (but excluding Sliding Bolts, Locks, Latches and Painting), all as per Drawings, Specifications and Directions of the Engineer.	88.00	Sft	12-7-b	1,381.160	Rs. 121,542/-
48	Supplying and fixing in position of First Class 1.50" thick deodar wood wrought joinery in doors/windows as per approved design fully paneled, or paneled & glazed, or fully glazed, both sides finished, including Glass, Chowkat, mongary/fittings i-e Holdfasts, Hinges, Tower Bolts, Handles, Chokes, Stopper, Cleats/ GI Clamp, and cord with hooks etc. (but excluding Sliding Bolts, Locks, Latches and Painting), all as per Drawings, Specifications and Directions of the Engineer.	1473.40	Sft	12-7-c	1,314.570	Rs. 1,936,887/-
49	Supplying and fixing in position of First Class 1.50" thick deodar wood wrought joinery in doors/windows as per approved design fully paneled, or paneled & glazed, or fully glazed, both sides finished, including Glass, mongary/fittings i-e Holdfasts, Hinges, Tower Bolts, Handles, Chokes, Stopper, Cleats/ GI Clamp, and cord with hooks etc. (but excluding Chowkat, Sliding Bolts, Locks, Latches and Painting), all as per Drawings, Specifications and Directions of the Engineer.	20.00	Sft	12-7-c -12-24-c (Pro)	900.900	Rs. 18,018/-
50	Supplying and fixing in position of First Class Deodar Wood Chowkats for Doors, Windows and CSW, wrought joinery including Holdfasts (but excluding Painting), all as per Drawings, Specifications and Directions of the Engineer.	20.00	Sft	12-24-c	413.670	Rs. 8,273/-

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Bill of Quantities						
Construction of Multipurpose Hall at Shaheed BB University, Sheringal, Dir Upper						
Sr. No.	Description	Qty	Unit	CSR/MRS Item No	Rate	Amount
1	2	3	4	5	6	7
51	Supply and Fixing MS Sheet 16 SWG (10"x2") Box Type Steel Chowkats (Single/ Double pattam) including fixing in position with incl. 6 Nos 1"x1/8"x 12 " MS Flat Iron Hold fasts and Flat Iron for Hinges, including PCC 1:2:4 etc. as specified.	200.00	Rft	12-56-a	353.860	Rs. 70,772/-
52	Supply and Fixing MS Sheet 16 SWG (5"x2") Box Type Steel Chowkats (Single/ Double pattam) including fixing in position with incl. 6 Nos 1"x1/8"x 12 " MS Flat Iron Hold fasts and Flat Iron for Hinges, including PCC 1:2:4 etc. as specified.	100.00	Rft	12-56-a (Pro)	235.907	Rs. 23,591/-
53	Supply and Fixing 22 SWG Satinless Steel Kick/Push plates fixed with stainlesssteel Screws @ 4"c/c all as per Drawings, Specifications and Directions of the Engineer.	10.00	Sft	12-48 (Pro)	160.620	Rs. 1,606/-
54	Supplying and fixing in position First Class Deodar Wood as in Chowkats for doors, fillets, beading or similar fancy joinery works etc. of/in any size, design and shape including sawing, planing, wroughting, etc. fixing in position, including nails and screws, hold fasts, etc. as and where directed complete in all respect all as per Drawings, Specifications and Directions of the Engineer.	20.00	Cft	12-01-a	6,944.380	Rs. 138,888/-
55	Supplying and Fixing in position of Aluminium Sliding Window, Premium Model 4" section, Anodized Champagne/Bronze/Black extruded section as specified including 5mm thick Glass, Handles & Autolocks and Fly/Insect Screening fixing on concrete, wooden or steel frames complete with all necessary fittings and complete in all respect all as per Drawings, Specifications and Directions of the Engineer.	3156.00	Sft	12-54-d-1	681.670	Rs. 2,151,351/-
56	Supplying and Fixing in position of Aluminium Hinges Window, Premium Model 4" section, Anodized Champagne/Bronze/Black extruded section as specified including 5mm thick Glass, Hinges Handles & Autolocks and Fly/Insect Screening fixing on concrete, wooden or steel frames complete with all necessary fittings and complete in all respect all as per Drawings, Specifications and Directions of the Engineer.	200.00	Sft	12-54-d-2	657.270	Rs. 131,454/-
57	Supplying and Fixing in position of Aluminium Fixed Glazing Window, Premium Model 4" section, Anodized Champagne/Bronze/Black extruded section as specified including 5mm thick Glass, fixing on concrete, wooden or steel frames complete with all necessary fittings and complete in all respect all as per Drawings, Specifications and Directions of the Engineer.	200.00	Sft	12-54-d-3	571.870	Rs. 114,374/-
58	Supplying and Fixing in position of Aluminium Swing Door (Premium Model) of Anodized Champagne/Bronze/Black extruded section as specified including Frosted/Tinted/Plain Glass of 5mm thick, handles, locks & Hydraulic Door Closers and fixing on concrete, wooden or steel frames complete with all necessary fittings and complete in all respect all as per Drawings, Specifications and Directions of the Engineer.	200.00	Sft	12-54-d-6	839.320	Rs. 167,864/-
59	P& F of approved Best Quality Heavy Duty Brass Sliding Bolt 12"long as per approved sample all as per Drawings, Specifications and Directions of the Engineer.	49	No	12-18-c-2	1,426.050	Rs. 69,876/-
60	P& F of Hydraulic Door Closers single action (best quality) heavy duty as per approved sample all as per Drawings, Specifications and Directions of the Engineer.	49	No	12-17-b	1,682.500	Rs. 82,443/-
61	Supplying, Making and Fixing in Position as per approved Design and Shape of 1/2" thick Deodar Wood Planking in Eave Board, Roof Ceiling and the like positions complete including Sawing, Wroughting, and Planning complete but without framing all as per Drawings, Specifications and Directions of the Engineer.	100.00	Sft	12-25-c	321.869	Rs. 32,187/-

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Bill of Quantities						
Construction of Multipurpose Hall at Shaheed BB University, Sheringal, Dir Upper						
Sr. No.	Description	Qty	Unit	CSR/MRS Item No	Rate	Amount
1	2	3	4	5	6	7
62	Supplying and fixing in Position of Acoustic Mineral Fiber Tiles Ceiling fixed in Aluminium angles, tees sections hung through GI wire/strip fixed in the roof with rawol plug and screws complete all as per Drawings, Specifications and Directions of the Engineer.	20412.38	Sft	12-40	165.940	Rs. 3,387,230/-
63	Supplying and fixing in Position of Sealed Gypsem false ceiling fixed in Aluminium angles, tees sections hung through GI wire/strip fixed in the roof with rawol plug and screws complete all as per Drawings, Specifications and Directions of the Engineer.	100.00	Sft	12-39-b-01	139.125	Rs. 13,912/-
64	Providing and fixing of Panelled Door made of Mild Steel, with forged door leaves of MS sheet 22 SWG fitted in hollow frame chowkat 3"x 4.5" made of M/S Sheet 18 SWG filled with PCC 1:3:6 etc. complete with all necessary fittings and hammer painting including carriage to site etc. complete in all respect all as per Drawings, Specifications and Directions of the Engineer.	21.00	Sft	12-47	626.470	Rs. 13,156/-
65	Supplying and fixing in position, of Mild Steel Grill of approved design, including welding and three coats of S/E paint etc. complete in all respect all as per Drawings, Specifications and Directions of the Engineer.	1896.00	Sft	12-50	288.390	Rs. 546,787/-
Chapter-13 (Painting & Varnishing)						
66	Preparation of surface & Painting to doors, windows, ceiling, walls and other surfaces such as wooden/steel/plastered or as and where directed/required in any colour, design, pattern, glass or mate finish (Synthetic Enamel Paint 1 Coat) all as per Drawings, Specifications and Directions of the Engineer.	22406.00	Sft	13-06-c-01	14.993	Rs. 335,922/-
67	Preparation of surface & Painting to doors, windows, ceiling, walls and other surfaces such as wooden/steel/plastered or as and where directed/required in any colour, design, pattern, glass or mate finish (Priming coat and Synthetic Enamel Paint 2 coats) all as per Drawings, Specifications and Directions of the Engineer.	100.00	Sft	13-06-c-01, 02x2 (Pro)	36.219	Rs. 3,622/-
68	Priming Coat of (pre-mixed, factory made) Chalk putty to form smooth base for distemper and P/E paint on walls and ceiling etc. complete all as per Drawings, Specifications and Directions of the Engineer.	100.00	Sft	11-22	2.019	Rs. 202/-
69	Prepare surface and Painting with Plastic Emulsion Paint Three Coats on Walls and Ceiling complete all as per Drawings, Specifications and Directions of the Engineer.	100.00	Sft	13-06-i	52.914	Rs. 5,291/-
70	Prepare surface and Painting with Emulsion Paint Three Coats on Walls and Ceiling complete all as per Drawings, Specifications and Directions of the Engineer.	29315.70	Sft	13-30-a,b,b (Pro)	30.040	Rs. 880,644/-
71	Prepare surface and applying three Coat of Weather Shield Paint complete all as per Drawings, Specifications and Directions of the Engineer.	100.00	Sft	13-38-a,b,b (Pro)	33.247	Rs. 3,325/-
72	Add extra labour for painting, varnishing etc. from 20ft height and above for every 10ft hight or part thereof requiring scaffolding, all as per Drawings, Specifications and Directions of the Engineer.	7752.98	Sft	13-37	1.010	Rs. 7,831/-

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Bill of Quantities						
Construction of Multipurpose Hall at Shaheed BB University, Sheringal, Dir Upper						
Sr. No.	Description	Qty	Unit	CSR/MRS Item No	Rate	Amount
1	2	3	4	5	6	7
	Chapter-16 (Roads, Bridges, Kerb Stones, Pipe Sleeves)					
73	Granular Sub Base Course crushed stone aggregate, any lead.	700.00	Cft	16-3-b	62.460	Rs. 43,722/-
74	Providing and Fixing of Kerb Stone (12"x18"x6") jointed and pointed in Cement Sand Mortar (1:3) in any position complete as per specifications and Directions of the Engineer.	330.00	Rft	16-63-a	204.792	Rs. 67,581/-
	Chapter-25 (Steel and Iron Works)					
75	Supplying and fixing in position, Mild Steel Angles, Flat, other Sections any size and thickness cut to dead length and fixing in position as in Dowel Bars for brick works and RCC column etc. and/or where required/ directed/ shown in drawings complete work all as per Drawings, Specifications and Directions of the Engineer.	10.00	Kg	25-09	154.563	Rs. 1,546/-
a.	Civil Works (Schedule items)				G. Total	Rs. 46,696,042/-
b.	Deduct of 7% withholding tax (included in CSR/MRS rates not payable/deductable to/from firms pertaining to tax exempted area.					Rs. 3,268,723/-
c.	Sub-Total (a-b)=c					Rs. 43,427,319/-
d.	Add 10% location factor (c x10/100)					Rs. 4,342,732/-
e.	Net-Total (c+d)=e					Rs. 47,770,051/-

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Bill of Quantities						
Construction of Multipurpose Hall at Shaheed BB University, Sheringal, Dir Upper						
Sr. No.	Description	Qty	Unit	CSR/MRS Item No	Rate	Amount
1	2	3	4	5	6	7
B.	Plumbing, Sanitary Installations & Water Supply Works (Schedule Items)					
1	P&F Glazed Earthen Ware WC European type (coupled set) comprising water closet, 3glns Glazed flushing cistern, and all necessary fittings such as Bakelite seat cover, plastic connection etc. including fixing in position all as specified, (Best quality, any Colour) all as per Drawings, Specifications and Directions of the Engineer.	10	No	14-01-b 14-02-a 14-10-b (Pro)	8,950.61	Rs. 89,506/-
2	P&F Glazed Earthen Ware WC Squatting type with blut-in foot rests, complete set comprising WC Orissa, and accessories, Plastic Flushing Cistern, plastic connection, PVC Hockey pipe, "P" or "S" Trap etc. including fixing in position all as specified, (Best quality, any Colour) all as per Drawings, Specifications and Directions of the Engineer.	4	No	14-03-b 14-78 14-32-b (Pro)	3,414.85	Rs. 13,659/-
3	P&F Glazed Earthen Ware WHB i/c set of brackets, Kit/Bolts, waste pipe and Brass waste coupling, complete Size 25"x18" with pedestal, (Best quality) all as per Drawings, Specifications and Directions of the Engineer.	1	No	14-05-b-02 14-41-a 14-43-a (Pro)	4,050.92	Rs. 4,051/-
4	P&F Glazed Earthen Ware WHB i/c set of brackets, Kit/Bolts, waste pipe and Brass waste coupling, complete Size 25"x18" but without pedestal, (Best quality) all as per Drawings, Specifications and Directions of the Engineer.	19	No	14-05-b-04 14-41-a 14-43-a (Pro)	3,356.47	Rs. 63,773/-
5	P&F 1/2" dia copper connection i/c check, nuts etc. complete, (Best quality) all as per Drawings, Specifications and Directions of the Engineer.	12	No	14-47-b	389.63	Rs. 4,676/-
6	P&F Soap Dish Plastic, heavy type, Best quality, any Colour all as per Drawings, Specifications and Directions of the Engineer.	20	No	14-20-a	274.73	Rs. 5,495/-
7	P&F Toilet Paper Holder Plastic, heavy type, Best quality, any Colour all as per Drawings, Specifications and Directions of the Engineer.	14	No	14-20-b	286.92	Rs. 4,017/-
8	P&F Towel Rail Plastic, heavy type, Best quality, any Colour, all as per Drawings, Specifications and Directions of the Engineer.	14	No	14-20-c	299.13	Rs. 4,188/-
9	P&F 5mm thick mirror 22"x16" Size, with plastic frame best quality complete (any Colour) all as per Drawings, Specifications and Directions of the Engineer.	20	No	14-17	1,463.81	Rs. 29,276/-
10	P&F best quality Plastic Shelf 24"x5" heavy type, Best quality, any Colour all as per Drawings, Specifications and Directions of the Engineer.	14	No	14-20-d	1,043.32	Rs. 14,606/-
11	P&F 3/4" CP Bib-Cock, heavy type: best quality all as per Drawings, Specifications and Directions of the Engineer.	14	No	14-24-a	567.53	Rs. 7,945/-
12	P&F 1/2" CP Tee Stop Cock (underground), heavy type : best quality all as per Drawings, Specifications and Directions of the Engineer.	20	No	14-23	666.90	Rs. 13,338/-
13	P&F 1/2" CP Tee Stop Cock, heavy type : best quality all as per Drawings, Specifications and Directions of the Engineer.	10	No	14-25	543.13	Rs. 5,431/-
14	P&F CP Mixing Valve for WHB, Sink, or wall shower heavy type : best quality all as per Drawings, Specifications and Directions of the Engineer.	2	No	14-27	2,129.13	Rs. 4,258/-
15	P&F CP or Brass oxidized Swan-Neck Cock 1/2" dia double way heavy type : best quality all as per Drawings, Specifications and Directions of the Engineer.	18	No	14-29	2,320.00	Rs. 41,760/-
16	P&F Cast Iron Floor Trap incl. CI Grating & Concrete Chamber all round : 4"x3", heavy type : best quality complete. all as per Drawings, Specifications and Directions of the Engineer.	2	No	14-31-b	806.00	Rs. 1,612/-

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Bill of Quantities						
Construction of Multipurpose Hall at Shaheed BB University, Sheringal, Dir Upper						
Sr. No.	Description	Qty	Unit	CSR/MRS Item No	Rate	Amount
1	2	3	4	5	6	7
17	P&F Glazed "P" Trap with PCC chamber and incl. 6"x6" PVC Grating heavy type : best quality complete. all as per Drawings, Specifications and Directions of the Engineer.	30	No	14-32-b	524.10	Rs. 15,723/-
18	P&F 4" Gully Trap with PCC, incl. Masonry Chamber 1'x1' and PVC Grating 6"x6", heavy type : best quality complete work, all as per Drawings, Specifications and Directions of the Engineer.	7	No	14-33	934.50	Rs. 6,542/-
19	P&F 3/4" dia, (Brass) Ball Valve, Float Valve, Back Valve, NR Valve heavy type : best quality complete, all as per Drawings, Specifications and Directions of the Engineer.	6	No	14-48-b	384.52	Rs. 2,307/-
20	--ditto-- but 1" dia.	4	No	14-48-c	585.83	Rs. 2,343/-
21	Supply and fixing Tubes, water quality G.I with all fittings (i.e sockets, bends, tees, elbows, Unions etc. where required) and laid complete in trenches (exclusive of excavation) or fixed to walls,floor (surface or concealed) and ceilings etc incl caps and plugs clamps and other accessories and fittings as required 2" dia (light), all as per Drawings, Specifications and Directions of the Engineer.	278.05	Rft	14-55-a	266.51	Rs. 74,103/-
22	--ditto-- but 1" dia.	200.00	Rft	14-55-d	130.03	Rs. 26,006/-
23	--ditto-- but 3/4" dia.	200.00	Rft	14-55-e	101.92	Rs. 20,384/-
24	--ditto-- but 1/2" dia.	200.00	Rft	14-55-f	77.92	Rs. 15,584/-
25	P&F of Gun Metal Peet/Gate Valve (screwed 1" dia) or Back valve best quality, all as per Drawings, Specifications and Directions of the Engineer.	4	No	14-28-a	1,331.80	Rs. 5,327/-
26	--ditto-- but 2" dia..	4	No	14-28-d	5,528.60	Rs. 22,114/-
27	Earthwork excavation in open cutting for sewers and manholes as shown in drawings including shuttering and tembring, dressing to correct section and dimentions according to templates and level, and removing surface water in all types of soil except shingle, gravel and rock upto 2.00 meter depth (except cost of refilling and tembring) complete all as per Drawings, Specifications and Directions of the Engineer.	200.00	Cft	03-44-a	5.062	Rs. 1,012/-
28	Filling with excavated earth as and where required and directed by the Engineer incl. filling watering, ramming, complete all as per Drawings, Specifications and Directions of the Engineer.	200.00	Cft	03-16-a	2.925	Rs. 585/-
29	Plain Cement Concrete (using Crushed Stone) under foundation and saddles, as and where required etc. including Placing, compacting, finishing & curing complete (including screening and washing of aggregates) (Ratio 1:4:8) complete all as per Drawings, Specifications and Directions of the Engineer.	50.00	Cft	06-05-i	155.207	Rs. 7,760/-
30	--ditto--but using Ratio 1:2:4.	50.00	Cft	06-05-f	205.519	Rs. 10,276/-
31	RCC as in Roof Slab, Beams, Column, Lintels, Girders & other structural members, insitu or precast laid in position or prestressed members cast in situe, Type-C (Minimum ratio 1:2:4) including form work complete all as per Drawings, Specifications and Directions of the Engineer.	50.00	Cft	06-06-a-03	270.094	Rs. 13,505/-
32	Supply & Fabrication of Mild Steel Reinforcement using Hot Rolled Deformed Bars Grade 40 for Cement Concrete, including cutting, bending, laying in position, making joints and fastening, including cost of binding wires and labour charges for binding of Steel Reinforcement (also includes removal of rust from bars) (overlaps, chairs, and wastage, shall not be measured & paid separately), all as per Drawings, Specifications and Directions of the Engineer.	100.00	Kgs	06-07-c	107.564	Rs. 10,756/-
33	Pacca/Burnt Brick Work in Foundation, Plinth and anywhere below Ground Level in Cement, Sand Mortar Ratio 1:4 complete as per specification, all as per Drawings, Specifications and Directions of the Engineer.	200.00	Cft	07-04-a-03	228.030	Rs. 45,606/-

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Bill of Quantities						
Construction of Multipurpose Hall at Shaheed BB University, Sheringal, Dir Upper						
Sr. No.	Description	Qty	Unit	CSR/MRS Item No	Rate	Amount
1	2	3	4	5	6	7
34	1/2" thick Cement Plaster in CM 1:4 on walls upto 20 ft hight all as per Drawings, Specifications and Directions of the Engineer.	400.00	Sft	11-9-b	20.240	Rs. 8,096/-
35	Application of Bitumen to plastered or cement concrete surface @ 20Lbs/100Sft all as per Drawings, Specifications and Directions of the Engineer.	300.00	Sft	13-10-a	15.314	Rs. 4,594/-
36	Supplying and fixing in position, Mild Steel Sections, Angles, Tees, Flat, Channels, Solid, Square, Solid Round Bars and Sheets any size and thickness including as in steps for Manholes etc. and/or where required/ directed/ shown in drawings complete work all as per Drawings, Specifications and Directions of the Engineer.	20.00	Kg	25-09	154.563	Rs. 3,091/-
37	P&F CI Manhole cover with frame etc. complete 12" dia, heavy type : best quality complete, all as per Drawings, Specifications and Directions of the Engineer.	5	No	14-37-a	1,489.06	Rs. 7,445/-
38	Providing and Fixing 2.5" (ave) thick RCC manhole cover, 22"square type with 2"x1/4" angle iron for cover and 2"x1/4" angle iron for fixing in slab with holdfast complete all as per Drawings, Specifications and Directions of the Engineer.	5	No	23-07	6,175.76	Rs. 30,879/-
39	P&L RCC pipes, moulded with cement concrete 1:1.5:3, with Spigot, Socket or Collars Joints etc. including cost of Reinforcement, Confirming to BS 5911: Part-1: 1981 Class "L" including carriage of pipes from factory to site of work, including lowering in trenches to correct alignment and grade, jointing, cutting of pipes where necessary, finishing and Testing etc. complete 6" dia, all as per Drawings, Specifications and Directions of the Engineer.	12.00	Rft	23-01-b	310.40	Rs. 3,725/-
40	--ditto-- but 9" dia.	302.00	Rft	23-01-c	385.34	Rs. 116,373/-
41	P&F approved best quality Brass Safety Valve for Water Heaters/Geyser,all as per Drawings, Specifications and Directions of the Engineer.	10	No	14-39-a	201.52	Rs. 2,015/-
42	Supply and fixing of 1.0 HP Monoblock or Submerciable water pump, single phase upto 90 ft head including valves and PPR Piping and other accessories controlling systems (elect and water supply etc.) all as per manufacturer instructions, complete in all respect including fixing in position as per drawings, specifications and directions of the Engineer.	1	Job	14-79-b	18,383.49	Rs. 18,383/-
43	Supplyinh of Water Tank Polyethylene (Super Tuff) (PE) Vertical 1500 gallon capacity, complete in all respect including fixing in position all as per Drawings, Specifications and Directions of the Engineer.	3	No	14-69-b-05	35,437.76	Rs. 106,313/-
a.	Plumbing, Sanitary Installations & Water Supply Works				G. Total	Rs. 888,441/-
b.	Deduct of 7% withhoding tax (included in CSR/MRS rates not payable/deductable to/from firms pertaing to tax exampmed area.					Rs. 62,191/-
c.	Sub-Total (a-b)=c					Rs. 826,250/-
d.	Add 10% location factor (c x10/100)					Rs. 82,625/-
e.	Net-Total (c+d)=e					Rs. 908,875/-

Seal and Signature of the Bidder
M/S_____

Bill of Quantities						
Construction of Multipurpose Hall at Shaheed BB University, Sheringal, Dir Upper						
Sr. No.	Description	Qty	Unit	CSR/MRS Item No	Rate	Amount
1	2	3	4	5	6	7
C.	Elect/Mechanical/fire alarm/Networking/CCTV Systems (Schedule Items)					
1	Supply and erection of 1" dia MS Conduit Pipe for wiring purpose including inspection boxes pull boxes, hooks, bend tees etc. complete with all specials; complete i/c making chase, cost of hooks and Drilling in walls where required all as per Drawings, Specifications and Directions of the Engineer.	100.00	Rft	15-01-a-3	59.88	Rs. 5,988/-
2	Supply and erection of 1/2" dia PVC pipe for wiring purpose including inspection boxes pull boxes, hooks, bend tees etc. complete with all specials; complete i/c making chase, cost of hooks and Drilling in walls where required all as per Drawings, Specifications and Directions of the Engineer.	100.00	Rft	15-02-b-01	30.66	Rs. 3,066/-
3	---ditto---but 3/4" i/d	4500.00	Rft	15-02-b-02	95.31	Rs. 428,895/-
4	---ditto---but 1" i/d	1400.00	Rft	15-02-b-03	88.14	Rs. 123,396/-
5	---ditto---but 1-1/4" i/d	100.00	Rft	15-02-b-04	102.52	Rs. 10,252/-
6	---ditto---but 1-1/2" i/d	400.00	Rft	15-02-b-05	112.92	Rs. 45,168/-
7	---ditto---but 2" i/d	20.00	Rft	15-02-b-06	118.28	Rs. 2,366/-
8	---ditto---but 3" i/d	20.00	Rft	15-02-b-07	136.48	Rs. 2,730/-
9	---ditto---but 1.5" i/d (recessed on wall)	500.00	Rft	15-02-a-05	47.45	Rs. 23,725/-
10	Supply and erection of 1/2" wide PVC Dura Duct (patty) for wiring purpose including fixing with nails and laying of wiring and drilling holes in walls where required complete work all as per Drawings, Specifications and Directions of the Engineer.	10.00	Rft	15-79-a	15.93	Rs. 159/-
11	---ditto---but 3/4" wide	10.00	Rft	15-79-a Pro	23.90	Rs. 239/-
12	---ditto---but 1" wide	500.00	Rft	15-79-b	24.47	Rs. 12,235/-
13	---ditto---but 1-1/4" wide	10.00	Rft	15-79-b Pro	30.59	Rs. 306/-
14	---ditto---but 1-1/2" wide	400.00	Rft	15-79-c	36.67	Rs. 14,668/-
15	---ditto---but 2" wide	100.00	Rft	15-79-d	67.17	Rs. 6,717/-
16	Supply and erection of 3/0.029" single core PVC insulated copper conductor 250/440 volts grade cable (BSS-2004) in pre-laid pipes etc. all as per Drawings, Specifications and Directions of the Engineer.	9200.00	Rft	15-05-a	12.03	Rs. 110,676/-
17	---ditto---but 3/0.036"	100.00	Rft	15-05-b	15.71	Rs. 1,571/-
18	---ditto---but 7/0.029"	3200.00	Rft	15-05-c	20.32	Rs. 65,024/-
19	---ditto---but 7/0.036"	1000.00	Rft	15-05-d	30.78	Rs. 30,780/-
20	---ditto---but 7/0.044"	6500.00	Rft	15-05-e	50.24	Rs. 326,560/-
21	---ditto---but 1/0.044"	100.00	Rft	15-05-e (Pro)	7.18	Rs. 718/-
22	Supply and erection of 7/0.064" Single core PVC insulated & Sheathed copper conductor 660/1100 volts grade cable (BSS-2004) in pre-laid pipes etc. all as per Drawings, Specifications and directions of the Engineer.	1500.00	Rft	15-07-a	92.78	Rs. 139,170/-

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Bill of Quantities						
Construction of Multipurpose Hall at Shaheed BB University, Sheringal, Dir Upper						
Sr. No.	Description	Qty	Unit	CSR/MRS Item No	Rate	Amount
1	2	3	4	5	6	7
23	---ditto--but 19/0.083"	560.00	Rft	15-07-d	476.83	Rs. 267,025/-
24	Supply and erection of 7/0.029" ECC single core PVC insulated copper conductor 250/440 volts grade cable (BSS-2004) in pre-laid pipes etc. all as per Drawings, Specifications and Directions of the Engineer.	5000.00	Rft	15-05-c	20.32	Rs. 101,600/-
25	---ditto--but 7/0.064"	400.00	Rft	15-05-f	102.96	Rs. 41,184/-
26	---ditto--but 19/0.064"	150.00	Rft	15-07-c	174.73	Rs. 26,210/-
27	Supply and erection of 4"x4" 16 SWG Mild Steel or PVC Boxes of 4" depth with/including 3/16" thick bacalite sheet top/cover having holes for switches, sockets, dimmers including fixing in position complete. all as per Drawings, Specifications and directions of the Engineer.	10	No.	15-09-a	133.89	Rs. 1,339/-
28	---ditto--but 7"x4"	10	No.	15-09-b	180.55	Rs. 1,806/-
29	---ditto--but 9"x4"	10	No.	15-09-c	218.06	Rs. 2,181/-
30	Supply and erection of best quality/approved make (premium quality) 56" sweep AC Ceiling Fan complete with GI Rod, Canopy, Blades, Capacitor and Dimmer etc. all as per Drawings, Specifications and directions of the Engineer.	42	No.	15-68-c	3,926.86	Rs. 164,928/-
31	Supply and erection of best quality/approved (premium quality) Steel body 12"sweep Exhaust Fan with shutter etc., all as per Drawings, Specifications and directions of the Engineer.	1	No.	15-69-a	2,419.25	Rs. 2,419/-
32	Supply and erection of best quality/approved (premium quality) Plastic frame body 12"x12" AC Exhaust Fan Frish Air circulation (double way) with shutter, blade, regulator etc., AC 220 SP all as per Drawings, Specifications and directions of the Engineer.	6	No.	15-77-c	3,288.23	Rs. 19,729/-
33	Supply and erection of best quality/approved (premium quality) Wall Bracket Fan (Pak made) all as per Drawings, Specifications and directions of the Engineer.	14	No.	15-78	3,307.00	Rs. 46,298/-
34	Earthing comprizing G I Wire No 8 SWG in GI pipe 1/2" dia recessed or on surface of wall and floor complete with 4.5' long GI pipe 2"dia with reducing socket 13' to 16' below G.L and 6' away from building complete in all respect (except excavation) along with 2"x2"x1/8" copper plate i/c riveting to copper tape and placing in mixture of salt and charcoal etc. complete, best quality as per drawings, Specifications and Directions of the Engineer.	2	No.	15-41,42 (Pro)	15,054.35	Rs. 30,109/-
35	Supply and erection of copper tape including copper staple & nails etc.size 1.5" wide 1/8" thick, best quality as per Specifications and directions of the Engineer.	550	Rft	15-43-a	373.12	Rs. 205,216/-
36	Supply and erection of 1" dia and 1 meter long lightning conductor copper rod with 5 spikes balls & base etc. complete, best quality as per Specifications and directions of the Engineer.	1	No	15-44	4,315.63	Rs. 4,316/-
a.	Elect/Mechanical/fire alarm/Networking/CCTV Systems (Schedule Items)				G. Total	Rs. 2,268,766/-
b.	Deduct of 7% withhoding tax (included in CSR/MRS rates not payable/deductable to/from firms pertaing to tax exampted area.					Rs. 158,814/-
c.	Sub-Total (a-b)=c					Rs. 2,109,953/-
d.	Add 10% location factor (c x10/100)					Rs. 210,995/-
e.	Net-Total (c+d)=e					Rs. 2,320,948/-

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M/S_____

Bill of Quantities						
Construction of Multipurpose Hall at Shaheed BB University, Sheringal, Dir Upper						
Sr. No.	Description	Qty	Unit	CSR/MRS Item No	Rate	Amount
1	2	3	4	5	6	7
A.	Civil Works (Non-Schedule items)					
1	Providing and laying of 3/4" thick pre-polished Ziarat White Marble or approved equivalent marbles (size 12"x 12") of required shape, over cement sand mortar (1:2), including filling with white/coloured cement, pigment, finishing complete in all respect all as per Drawings, Specifications and Directions of the Engineer.	631.82	Sft	NSI	602.00	Rs. 380,356/-
2	Providing and laying of 3/4" thick pre-polished Ziarat White Marble or approved equivalent marbles (size 18"x 18") of required shape, over cement sand mortar (1:2), including filling with white/coloured cement, pigment, finishing complete in all respect all as per Drawings, Specifications and Directions of the Engineer.	7171.40	Sft	NSI	858.00	Rs. 6,153,065/-
3	Providing and laying of 3/4" thick pre-polished Ziarat White Marble or approved equivalent marbles (size 18"x 36") of required shape, over cement sand mortar (1:2), including filling with white/coloured cement, pigment, finishing complete in all respect all as per Drawings, Specifications and Directions of the Engineer.	2591.50	Sft	NSI	858.00	Rs. 2,223,505/-
4	Providing and laying of 1/2" thick pre-polished Ziarat White Marble or approved equivalent marbles (for Rizers of Stairs one piece) of required shape, over cement sand mortar (1:2), including filling with white/coloured cement, pigment, finishing complete in all respect all as per Drawings, Specifications and Directions of the Engineer.	362.69	Sft	NSI	602.00	Rs. 218,337/-
5	Providing and laying of 3/4" thick pre-polished Ziarat White Marble or approved equivalent marbles (for Traed of Stairs etc. one piece) of required shape, over cement sand mortar (1:2), including filling with white/coloured cement, pigment, finishing complete in all respect all as per Drawings, Specifications and Directions of the Engineer.	765.44	Sft	NSI	858.00	Rs. 656,748/-
6	Providing and laying of 1/2" thick pre-polished Mohmmmand Marble of approved colour or approved equivalent marbles (size 12"x 18") of required shape, over cement sand mortar (1:2), including filling with white/coloured cement, pigment, finishing complete in all respect all as per Drawings, Specifications and Directions of the Engineer.	2695.50	Sft	NSI	210.00	Rs. 566,055/-
7	Providing and applying Sand Tex Coating of approved colour and pattern with recommended sealer and thinner on the surface of cement plaster on the exterior surface of the building including 3/4" thick cement plaster in CM 1:4, including cleaning of surface all as per manufacturer instructions all as per Drawings, Specifications and Directions of the Engineer.	7448.42	Sft	NSI	60.00	Rs. 446,905/-
8	Supplying and Fixing of Stain less steel railing of approved design and shape including Hand Rail, Bends, Corners, polishing complete wok all as per Drawings, Specifications and Directions of the Engineer.	50.00	Rft	NSI	1,849.00	Rs. 92,450/-
9	Preparation of surface and applying of Lacquer Polishing to doors etc. complete work all as per Drawings, Specifications and Directions of the Engineer.	3402.89	Sft	NSI	80.00	Rs. 272,231/-
a.	Civil Works (Non-Schedule items)				G. Total	Rs. 11,009,651/-
b.	Deduct of 7% withhoding tax (included in NSI Rates not payable/deductable to/from firms pertaing to tax exempted area.					Rs. 770,676/-
c.	Net-Total (a-b)=c					Rs. 10,238,976/-

Seal and Signature of the Bidder
M/S _____

Bill of Quantities						
Construction of Multipurpose Hall at Shaheed BB University, Sheringal, Dir Upper						
Sr. No.	Description	Qty	Unit	CSR/MRS Item No	Rate	Amount
1	2	3	4	5	6	7
B. Plumbing, Sanitary Installations & Water Supply Works (Non-Schedule Items)						
1	Providing, fixing, cutting, jointing and testing UPVC Soil, Waste and vent, piping including solvent or cement jointing, clamping to walls and ceiling, hangers, supports, (excluding specials & fittings) of 2" dia., all as per Drawings, Specifications and Directions of the Engineer.	40.00	Rft.	24-18-a-1 Pro	76.21	Rs. 3,049/-
2	---ditto-- but 3" dia.	265.00	Rft.	24-18-a-1	124.08	Rs. 32,881/-
3	---ditto-- but 4" dia.	170.00	Rft.	24-18-a-2	179.48	Rs. 30,512/-
4	---ditto-- but 6" dia.	50.00	Rft.	24-18-a-3	303.49	Rs. 15,175/-
5	Providing, fixing, cutting, jointing and testing UPVC fittings for UPVC piping such as Tees, Sockets, L.Bows, Yee, Reducers, Cowel and the like items with Solvent or cement jointing, clamping to walls and ceiling, hangers, supports, of 3" dia, all as per Drawings, Specifications and Directions of the Engineer.	20	No.	24-26-a-2	338.08	Rs. 6,762/-
6	---ditto-- but 4" dia.	50	No.	24-26-a-3	477.52	Rs. 23,876/-
7	---ditto-- but 6" dia.	10	No.	24-26-a-4	960.32	Rs. 9,603/-
8	P&F approved best quality Elect Water Heaters/Geyser 15 gallons capacity, best quality complete with thermostat, etc. all as per Drawings, Specifications and Directions of the Engineer.	10	No	14-47-a Pro	14,306.50	Rs. 143,065/-
9	P&F Muslim Shower, double bibcock, and Stainless steel pipe complete set, , heavy type : best quality all as per Drawings, Specifications and Directions of the Engineer.	14	No	14-26-a 14-25	1,769.45	Rs. 24,772/-
10	P&F of Fire Hydrant flanged and drilled to BS Table "18 -1-9" complete with rubber packing 3" dia, heavy duty best quality complete, as per Specifications and directions of the Engineer.	1	Job	18-336 Sor	12,936.87	Rs. 12,937/-
11	P&F of Fire Extinguisher (Portable) CO2, 7 Kg capacity, as per Specifications and directions of the Engineer.	2	No	29-371 Sor	4,914.00	Rs. 9,828/-
12	P&F of Fire Extinguisher (Portable) dry powder type, 6 Kg capacity, as per Specifications and directions of the Engineer.	1	No	29-372 Sor	2,574.00	Rs. 2,574/-
13	Providing & Installation of hose reel cabinets wall mounted swinging arm type, made of 18 swg. M.S sheet with glass front, fitted with push lock, size 915mm X 76mm x 228mm, including 25 mm brass gate valve at inlet, fire hose 25mm x 30mtr high pressure, fitted with couplings, One nozzle, Nylon plastic spray type, cabinet One quick release hose rack on which the hose will be arranged, cabinet painted with three coats of S/E paint FIRECHIEF make. complete in all respect as per drawings, specifications, and / or as directed by the Engineer Incharge.	1	Job	29-350 Sor	54,000.00	Rs. 54,000/-
14	P&F PVC Grating 6"x6" fixed in position best quality all as per Drawings, Specifications and Directions of the Engineer.	10	No	SoR 28-1021	325.00	Rs. 3,250/-
a.	Plumbing, Sanitary Installations & Water Supply Works (Non-Schedule Items)				G. Total	Rs. 372,283/-
b.	Deduct of 7% withholding tax (included in NSI Rates not payable/deductable to/from firms pertaining to tax exempted area.					Rs. 26,060/-
c.	Net-Total (a-b)=c					Rs. 346,223/-

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Bill of Quantities						
Construction of Multipurpose Hall at Shaheed BB University, Sheringal, Dir Upper						
Sr. No.	Description	Qty	Unit	CSR/MRS Item No	Rate	Amount
1	2	3	4	5	6	7
C.	Elect/Mechanical/fire alarm/Networking/CCTV Systems (Non-Schedule Items)					
	All items of Electrical works described under title "Description" unless specifically indicated other wise, shall be deemed to be read in terms of supply, storing, protecting, making, ' assembling, installing, applying, laying, fixing, testing commissioning, clearing etc. of the same inclusive of but not limited to all materials, labour, tools, plants equipments, appliances etc. as required for the completion and maintenance of the Electrical work as per drawings specifications, and/or as directed by the Engineer Incharge.					
IE-01	<u>LIGHT FITTINGS AND FIXTURES</u>					
	Supply, installation, fixing, wiring, connection, testing and commission of LED fittings and fixtures, ceiling mounted or ceiling suspended or installed in the false ceiling or wall mounted, pole mounted, weather proof, ' adjustable or non-adjustable, complete with chokes, spring loaded rotary holders starter, power factor correction capacitors, antiradio interference starters, ballast with brackets and down rod, industrial shade, brass lamp holder proper gasketting necessary fixing accessories internal wiring, connection, earthing terminal etc. These are to be installed as and where shown on drawings or as required as per site conditions. Complete in all respects. The approved manufactures- M/S Philips/Sunlights or equivalent as approved by the engineer.					
	LED LIGHTS					
	i) LED tube rod with 1X18 watts (4ft)	2	Nos.	NSI	1875.00	Rs. 3,750/-
	ii) LED tube rod with 2X18 watts (4ft)	2	Nos.	NSI	3690.00	Rs. 7,380/-
	iii) LED mirror light 1X9watts 2ft	11	Nos.	NSI	1450.00	Rs. 15,950/-
	iv) LED down lighter with 1X7watts powder paint metal sheet,housing anodized aluminium reflect.	36	Nos.	NSI	1250.00	Rs. 45,000/-
	v) LED Wall type light 1X7 watts	23	Nos.	NSI	1250.00	Rs. 28,750/-
	vi) LED Weather proof bulkhead light with 1X9 watts IP 54 housing.	18	Nos.	NSI	3750.00	Rs. 67,500/-
	vii) LED down light recessed type with 1X7watts outer ring in powder paint metal sheet,housing anodized aluminium reflect.	154	Nos.	NSI	1125.00	Rs. 173,250/-
	viii/ Flood light HPI-T 400 w Lamp	16	Nos.	NSI	18500.00	Rs. 296,000/-
1.2	FANS BOXS.					
	Providing & fixing of plastic body fan box, suitable for RCC roof with MS bar 5/8" dia & covered with round white plastic sheet complete in all respect best quality all as per Drawings, Specifications and directions of the Engineer.	42	Set	15-25	318.11	Rs. 13,361/-
IE-02	<u>SWITCHES & SOCKETS OUTLET</u>					
	Supply, installation,of gang switch plates complete with back boxes (plastic make) switch socket outlets etc. complete in all respect. Approved manufactures M/S Bush Hilife (Pakistan) Switch Kids, Aqua Switches, Orange Electric or equivalen as approved by the engineer.					
2.1	Switches 5 Amp. Recessed.	138	Nos.	NSI	68.00	Rs. 9,384/-
2.2	2 Pin socket.	24	Nos.	NSI	57.00	Rs. 1,368/-

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Bill of Quantities						
Construction of Multipurpose Hall at Shaheed BB University, Sheringal, Dir Upper						
Sr. No.	Description	Qty	Unit	CSR/MRS Item No	Rate	Amount
1	2	3	4	5	6	7
2.3	Socket out let combind with one pole switch complete.					
	i) 3-PIN 10A universal type.	32	Nos.	NSI	538.00	Rs. 17,216/-
	ii) 3-PIN 20A Porcelaine base	20	Nos.	NSI	698.00	Rs. 13,960/-
2.4	Back boxes with Gang Plate.					
	i) 1-3 gang 1 way switch/plate	52	No.	NSI	237.00	Rs. 12,324/-
	ii) 4 gang 1 way switch/plate	25	No.	NSI	258.00	Rs. 6,450/-
	iii) 6 gang 1 way switch/plate	35	No.	NSI	294.00	Rs. 10,290/-
2.5	Fan dimmer Complete.	1	No.	NSI	279.00	Rs. 279/-
IE-03	<u>SUB Main Panel Board</u>					
	Fabrication, supply, erection and testing of Sub Main Panel Board to be installed on ground floor, comprising of cubicles, frame made of sheet steel 14 SWG and doors of 16 SWG, with flexible earthing strips, degreased and de-rusted, zinc phosphated, finished with electro-static powder coating of 15 micron thickness in approved color, panel housing to comply with IP-44 protection, indoor floor mounting, in free standing design, with flush door, lockable handle, catchers, all auxiliaries, internal wiring, designation labels on MCCBS, earthing bar, numbering leads on the control wires, panel suitable for system Voltage 415 V, 50 Hz, 3 Phase and neutral, bus bars of 99.8% purity electrolytic copper, including cost of cable terminal blocks, cable termination lugs, brass cable glands for incoming & outgoing cables, wiring from breakers, indication lamps, instruments and control all accessories complete in all respects.					
	All incoming and outgoing breakers shall be accessible by opening the front door having additional M.S. sheet cover. Gaskets shall also be provided where necessary. All MCCBs shall be suitable to operate without any de-rating at 45 ⁰ C ambient temperature and shall be of one make only and not a mixture of more than one make. Circuit's layout shall conform to the single line diagrams. Make Legrand (France) / ABB (UK) M.G(Franc) or equivalen.					
3.1	<u>Incoming</u>					
a	1-160 Amps triple pole MCCB Adj, overload and short circuit protection, RC: not less 36 kA					
b	4-Nos Copper Bus Bars of capacity 300Amp electrolytic copper 99.9% purity, bus bars should be electro-tinned throughout the length.					
C.	3-Air cooled ring type CTs 150/5 Amps having suitable output and accuracy.					
d	1-Digital type Amp meter scaled 150/5 Amps square shaped suitable for operation with CTs with Phase Selector switch.					
e	1-Digital type Voltmeter scaled 0-600 Volts of square shaped with Voltmeter selector switch of 4 positions.					
f	1-Earthing bar with necessary punched holes, nuts, bolts and washers, etc.					
g	2-Earthing terminals, all earth leads to have green base with yellow stripe.					
h	Required sets of cable terminal blocks and cable terminal lugs suitable for outgoing cables complete with brass cable glands on bottom of panel.					

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Bill of Quantities						
Construction of Multipurpose Hall at Shaheed BB University, Sheringal, Dir Upper						
Sr. No.	Description	Qty	Unit	CSR/MRS Item No	Rate	Amount
1	2	3	4	5	6	7
3.2	Outgoing					
a	2-50, 2-60, 1- 30 Amps with neutral link MCCB TP having overload and short circuit protection, RC: not less than 25 Ka					
b	1 Spaces in SMPB to accommodate MCCBs in future of rating 50/40/30 Amps.					
	complete set of above items mentioned for incoming (3.1) ser a to h and out going (3.2) ser a to b.	1	Job	NSI	137100.00	Rs. 137,100/-
IE-04	<u>DISTRIBUTION BOARDS</u>					
	Supply, installation, connection of wires/cables, testing and commissioning of 500 volts, 50 Hz, Three-Phase and neutral distribution boards (DBs) concealed type, wall mounted to be installed as and where shown on drawings, made of M.S. sheet 16 SWG with hinged door, handle, catcher, earthing bar, neutral strip, internal wiring from MCCBs terminating on cable terminal blocks. One coat of antirust and anti-corrosive paint with further two coats of enamelled paint of approved colour, all necessary materials equipped with Analogue Square Shaped Voltmeter scaled with 0-500 volts and with indication light complete in all respects and manufactured by any one of the approved manufacturers: conforming to single line diagram. D.B shall be equipped with the following components as shown on drawings complete in all respect or as approved by the Engineer Incharge. MCCB /MCB Make- Legrand (Franc) /ABB (UK) or equivalen.					
i)	LDB-G1 (6 Ways Three-Phase) Typical LDB-G2 comprising the following	2	Job	NSI	27300.00	Rs. 54,600/-
a	INCOMING					
i.	1-40A TP MCCB Rc=25kA					
b	OUTGOING					
i	13-10A SP MCB Rc=6kA					
ii	2-16A SP MCB Rc=6kA					
iii	3-10/16 SPARE SP MCB Rc=6kA					
ii)	PDB-G (4 Ways Three-Phase) Typical PDB-G2 comprising the following	2	Job	NSI	25200.00	Rs. 50,400/-
a	INCOMING					
i.	1-50A TP MCCB Rc=25kA					
b	OUTGOING					
i	10-16A SP MCB Rc=6kA					
ii	2-16 SPARE SP MCB Rc=6kA					
IE-04	<u>Power Cables</u>					
4.1	P/L LT Cable 4 core 35mm ² copper conductor (armoured) complete in all respect.	500.00	Rft	NSI	592.00	Rs. 296,000/-
IE-05	<u>EARTHING SYSTEM (PLATES TYPE)</u>					
5.1	EARTH CONNECTING POINT (ECP)					
	Supply and installation of tinned earth connecting points consisting of copper plate 12" long x 6" wide x 1/2" thick to be installed and where shown on drawings, complete with fixing arrangement, brass nut bolts, washers, lugs 1/2" dia holes to facilitate connections of incoming copper conductors and outgoing CPC.	2	Nos	NSI	2500.00	Rs. 5,000/-

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Bill of Quantities						
Construction of Multipurpose Hall at Shaheed BB University, Sheringal, Dir Upper						
Sr. No.	Description	Qty	Unit	CSR/MRS Item No	Rate	Amount
1	2	3	4	5	6	7
IE-06	TELECOMMUNICATION SYSTEM					
6.1	Telephone Points on wall					
	Wiring for each telephone point on wall with 2 pair telephone cable manufactured by any one or the following manufacturers Pakistan/Newage cables, from TDB to telephone point in and including cost of 25mm dia, PVC conduit heavy duty make Popular, Beta, Dadex, recessed in slabs, floors,walls, columns or on slab above false ceiling or as required as per site conditions, including M.S back box made of 16 SWG and RJ-11 socket outlet.	3	Points	NSI	1750.00	Rs. 5,250/-
6.3	Telephone Cable					
	Supply, installation,connection of followings pair ,telephone cable to be pulled up from MDF to TDB,s to be pulled in prelaidd PVC conduit, including cost of identification tags, all necessary material / accessories complete in all respect. Actual length of cables to be installed shall be practically measured at site by the Contractor, duly authenticated by the employers Electrical Engineer before placing the order with hte manufacturer, however, approximate length of cables are shown herewith. Payments shall be made as per actual length installed.					
	i) 10 pair telephone cable from MDF to various TJB's.	200	Rft	NSI	65.00	Rs. 13,000/-
6.4	Telephone Junction Box(TJB)					
	Supply, installation of telephone junction box 16 SWG to be concealed in wall with 2 coats of anti rust paint, earthing terminal, krone strips and complete in all respects.					
	i) Telephone Junction Box 100mm x 175mm	1	Nos	NSI	2500.00	Rs. 2,500/-
IE-07	COMPUTER DATA NETWORKING					
	General					
	All items of Net work system under title "Description" unless specifically indicated otherwise, shall be deemed to be read in terms of supply, storing, protecting, making, assembling, installing, applying, laying, fixing, testing, commissioning, clearing etc. including all materials, labor, tools, plants equipments, appliances etc. as required for the completion and maintenance net work system as per drawings, specifications, or as directed by the Engineer In charge.					
7.1	UTP Cat-6 Cable					
	Wiring for Computer points on walls with UTP Cat 6 10 Gig Cable , computer cable tinned copper conductor PVC insulated PVC sheathed manufactured by M/s Krone, Clipsal, 3M buried in floor walls, columns or laying in cable tray or as required as per site conditions, complete in all respects.					
	i) UTP Cat6 10 Gig Cable	1	Coil (1000) Rft	NSI	46000.00	Rs. 46,000/-
7.2	FACE PLATE+ SINGLE / DOUBLE I/O+ BACK BOX, for CAT-6					
	Supply at site, installation, testing and commissioning of face plate Make: Clipsal, 3M ,APA					
	i) Face plate with single I/O	10	Job	NSI	700.00	Rs. 7,000/-
	ii) Face plate with Double shutter , duoble I/O	5	Job	NSI	1300.00	Rs. 6,500/-
	iii) Bake boxes from approved make	100	Job	NSI	80.00	Rs. 8,000/-

Seal and Signature of the Bidder
M/S_____

Bill of Quantities						
Construction of Multipurpose Hall at Shaheed BB University, Sheringal, Dir Upper						
Sr. No.	Description	Qty	Unit	CSR/MRS Item No	Rate	Amount
1	2	3	4	5	6	7
7.4	FLOOR BOX					
	Fabrication, supply, instalaltion of floor outlet boxes made of mild steel 16 SWG of appropriate size but not less than 250mm X 250mm X 100mm deep with openable hinged cover 2.5mm thick, all necessary materials/arrangements for fixation orf sockets, holes for passage of outgoing cables, rubber,groumet and earthing terminals	4	Job	NSI	1250.00	Rs. 5,000/-
IE-8	CONVENTIONAL FIRE ALARM SYSTEM					
8.1	CONVENTIONAL FIRE ALARM CONTROL PANEL (FACP)					
	Supply, installation, testing and commissioning of conventional Fire Alarm Control Panel consisting of 2 zone complete with battery and charger and all other necessary materials, required to complete in all respects, as per specification and approved by the Engineer.Make:Menvier (U.K), Bentel (Italy), Honey Well (U.K)/Hochiki (UK).	1	Job	NSI	28800.00	Rs. 28,800/-
8.2	CONVENTIONLSMOKE DETECTOR					
	Supply, installation, testing and commissioning of conventional Smoke Detector make as specified to be installed on R.C.C slab/false ceiling, all necessary accessories complete in all respects as per specification and approved by the Engineer. Make: Menvier (U.K), Bentel, Honey well (U.K)/Hochiki (UK)or equivalen..	20	Job	NSI	3094.00	Rs. 61,880/-
8.3	CONVENTIONAL HEAT DETECTOR					
	Supply, installation, testing and commissioning of conventional Heat Detector make as specified to be installed on R.C.C slab/false ceiling, all necessary accessories complete in all respects as per specification and approved by the Engineer. Make: Menvier (U.K), Bentel, Honey well (U.K)/Hochiki (UK). or equivalen.	1	Job	NSI	3094.00	Rs. 3,094/-
8.4	CONVENTIONAL MANUAL CALL POINT					
	Supply, installations testing and commissioning of conventional Manual Call point complete with back box to be installed recessed in walls, columns or as required with end of line diode where required make as specified to be installed as shown on drawing including cost of all necessary materials required to complete in all respect as per specification and approved by the Engineer. Make:Menvier (U.K), Bentel, Honey well (U.K) or equivalen.	1	Job	NSI	2408.00	Rs. 2,408/-
8.5	CONVENTIONAL FIRE ALARM SOUNDER					
	Supply, installations testing and commissioning of conventional Fire Alarm Electronic Sounder to be installed recessed make as specified including cost of all necessary accessories required to complete in all respects as per specification and approved by the Engineer. Make:Menvier (U.K), Bentel, Honey well (U.K) or equivalen.	1	Job	NSI	5076.00	Rs. 5,076/-
IE8	Supply, installation ,testing and commissioning of 2-core Shielded Retardant wires from FACP to smoke/heat detectors and manual to be pulled in prelaidd PVC conduit including cost of all necessary materials required to complete in all respects as per specification and approved by the Engineer.	1	Job	NSI	5076.00	
8.6	a) 2-Core Shielded Retardant wire 1.5 mm2	100.00	Rft	NSI	97.00	Rs. 9,700/-
IE-9	CCTV SYSTEM					

Seal and Signature of the Bidder
M/S_____

Bill of Quantities						
Construction of Multipurpose Hall at Shaheed BB University, Sheringal, Dir Upper						
Sr. No.	Description	Qty	Unit	CSR/MRS Item No	Rate	Amount
1	2	3	4	5	6	7
9.1	UTP Cat-6 Cable					
	Wiring for Computer points on walls with UTP Cat 6 10 Gig Cable , computer cable tinned copper conductor PVC insulated PVC sheathed manufactured by M/s Krone, Clipsal, 3M buried or equivalent in floor walls, columns or laying in cable tray or as required as per site conditions, complete in all respects.					
	i) UTP Cat6 10 Gig Cable	1	Coil (1000) Rft	NSI	46000.00	Rs. 46,000/-
IE-10	<u>LIGHTNING PROTECTION SYSTEM</u>					
	Supply, installation and testing connecting, and commissioning of all material including Bond & Clamps etc with metal work in the vicinity of the LPS , to avoid the danger of side flashing and services of the complete lightning protection system as specified here in the earthing resistance of lightning protection system at any point in the system should not exceed ten (10) ohms. sub-distribution board having overload and short circuit protection of suitable rupturing capacity with metering , phase indication lamps , earthing , nuts, bolts, washers, cableglands, terminals fitted with required size of boards as per drawings and specification, having pabble gray colour according to IEC standard with enadiozing process approved by engineer complete in all respects.					
10.1	<u>DOWN CONDUCTOR (D.C)</u>					
	Supply, installation, connections of 1x70mm2 stranded copper conductor as down conductor to be installed in vertical position and fixed on the external walls or columns as shown on drawing including cost of making test joints,bends, corners, saddles all foxing accessories complete in all respects.Copper strips connected with the roof conductors shall be brought down to earth electrode complete in all respect as per drawings, specifications and approved by the Engineer.	425.00	Rft	NSI	180.00	Rs. 76,500/-
10.2	<u>EARTH CONNECTING POINT (ECP)</u>					
	Supply and installation of tinned earth connecting points consisting of copper plate 12" long x 6" wide x 1/2" thick to be installed and where shown o drawings, complete with fixing arrangement, brass nut bolts, wasehrs, lugs 1/2' dia holes to facilitate connections of incoming copper conductors and outgoing CPC.	2	Nos	NSI	2500.00	Rs. 5,000/-
10.5	<u>EARTH ELECTRODE</u>					
	Supply, installation , connections of G.I earth electrodes 5/8" dia 10' long , driven vertically in ground , all necessary materials / accessories complete in all respect as per drawings, specifications i.e lightning protection system (LPS) earth resistance measured at one point should not exceed 10 Ohms.	4	Job	NSI	12750.00	Rs. 51,000/-

Seal and Signature of the Bidder
M/S_____

Bill of Quantities						
Construction of Multipurpose Hall at Shaheed BB University, Sheringal, Dir Upper						
Sr. No.	Description	Qty	Unit	CSR/MRS Item No	Rate	Amount
1	2	3	4	5	6	7
IE-11	CCTV SYSTEM					
	General					
	Providing, installing, commissioning and testing of CCTV system fully automatic 240vac, 50 hz no rewiring switching or adjustment required according to ip-54 and IEC 529 standard with control output with solid state switches and control devices, having fully automatic with control panel with all accessories complete in all respect in accordance with the specifications manufacturers instructions and as approved by the Engineer. Brands Samsung,Sony,Honeywell (USA) and GE.					
11	Full hd 4Megapixel Bullet Camera with following specifications; 4m resolution, 2.8 , 12mm (4.3x) motorized varifocal lens, 20 fps @ 4m , max.30 fps @ 2m all resolution, H.265, H.264, MJPEG codec supported, multiple streaming, Day & Night (ICR), WDR (120dB), Motion detection, tampering, defocus detection, Micro SD (128GB) memory slot, Poe/ 12V DC, IR viewable length 30m, IP66, IK10, Hallway view support, LDC support (Lens Distortion correction) complete in all respect as per drawings, specifications and Directions of the Engineer.	2	No	NSI	56,000.00	Rs. 112,000/-
12	PTZ Speed Dome Camera with following specifications; Compatible with PTZ 3Megapixel or above cameras, Superior system compatibility by CMS, NET-i-viewer support, 3D joystick control for zoom, USB Interface, Easy Firmware Upgrade, complete in all respect as per drawings, specifications and Directions of the Engineer.	2	No	NSI	64,500.00	Rs. 129,000/-
	Networking Video Recorder (NVR)					
13	Providing, installation,testing and commissioning of 32 Channel Networking Video Recorder (Stand Alone,Non PC Based) with 250GB to 4TB HDD internal storage, records upto 400 ips PAL / 480ips NTSC, MPEG4 code flow video compression , full Pentaplex means Display, Recording, Playback, Networking and Back up. Wireless Remote Control,Back-up devices. Removable HDD CD-RW & USB (Optional View through LAN, WAN ,Internet.	1	No	NSI	187,500.00	Rs. 187,500/-
14	Providing, installation, testing and commissioning of 8 Channel Networking Video Recorder (Stand Alone,Non PC Based) with 250GB to 4TB HDD internal storage, records upto 400 ips PAL / 480ips NTSC, MPEG4 code flow video compression , full Pentaplex means Display, Recording, Playback, Networking and Back up. Wireless Remote Control, Back-up devices. Removable HDD CD-RW & USB (Optional View through LAN, WAN ,Internet.	1	No	NSI	94,000.00	Rs. 94,000/-
15	Providing installation, testing and commissioning of Colour monitors with following features; 40" LCD Screen, High Performance Resolution, Automatic colour Switching system, Front Panel Control, Free voltage (100-240 VAC), Built in speakers, S-VHS input for separate, Video in 2 BNC, Audio input/output 2 RCA, Power consumption 67 W, Enclosure metal, Stabilizer and other accessories.	1	No	NSI	45,750.00	Rs. 45,750/-
16	Providing installation, testing and commissioning of Auto Iris lens complete in all respects.	1	No	NSI	8,000.00	Rs. 8,000/-
17	Supplying, Testing, Commissioning, and Installation of Single Phase Stabilizer twenty thousands watts Pak made (Copper) including all accessories such as cover, power cable, MS stand/frame power plug and switches etc. all as per Specifications and directions of the Engineers.	4	No	NSI	30,000.00	Rs. 120,000/-
18	Supplying, Testing, Commissioning, and Installation of Single Phase UPS 12-V (2000W) Pak made (Copper) including all accessories such as cover, power cable, MS stand/frame power plug and switches etc. all as per Specifications and directions of the Engineers.	1	No	NSI	25,000.00	Rs. 25,000/-

Seal and Signature of the Bidder
M/S_____

Bill of Quantities						
Construction of Multipurpose Hall at Shaheed BB University, Sheringal, Dir Upper						
Sr. No.	Description	Qty	Unit	CSR/MRS Item No	Rate	Amount
1	2	3	4	5	6	7
19	Supplying, Testing, Commissioning, and Installation of 200 Amp (Dry) Battery (Exide, AGS or equivalent) with including all accessories such as Power Cable, MS Stand/frame etc. all as per Specifications and directions of the Engineers.	2	No	NSI	25,000.00	Rs. 50,000/-
20	Supply, installation and testing connecting, and commissioning of 30kVA Diesel Generator Set, i/c AMF/ATS panel, locally fabricated sound proof canopy, cabling, earthing, transportation etc complete in all respects approved by the engineer incharge .	1	No	NSI	1,408,000.00	Rs. 1,408,000/-
21	Providing installation, testing and commissioning of Coaxial cable including PVC conduit of 3/4" Beeta, Popular as per manufacturers recommendation specification.	100.00	Rft	NSI	92.06	Rs. 9,206/-
a.	Elect/Mechanical/fire alarm/Networking/CCTV Systems (Non-Schedule Items)				G. Total	Rs. 3,836,476/-
b.	Deduct of 7% withholding tax (included in NSI Rates not payable/deductable to/from firms pertaining to tax exempted area.					Rs. 268,553/-
c.	Net-Total (a-b)=c					Rs. 3,567,922/-

Seal and Signature of the Bidder
M/S_____

SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER

SR. NO.	DESCRIPTION	DRG. NO.
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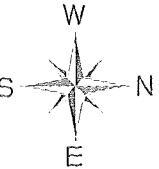
ARCHITECTURAL

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SEPTEMBER, 2018
CONSULTANTS



ASSOCIATED CONSULTING ENGINEERS ACE (PVT) LTD
Architectural & Town Planning Services, Section
Ground Floor, 36 Civic Center, M-Block,
Model Town Extension, Lahore



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POWER
STATION

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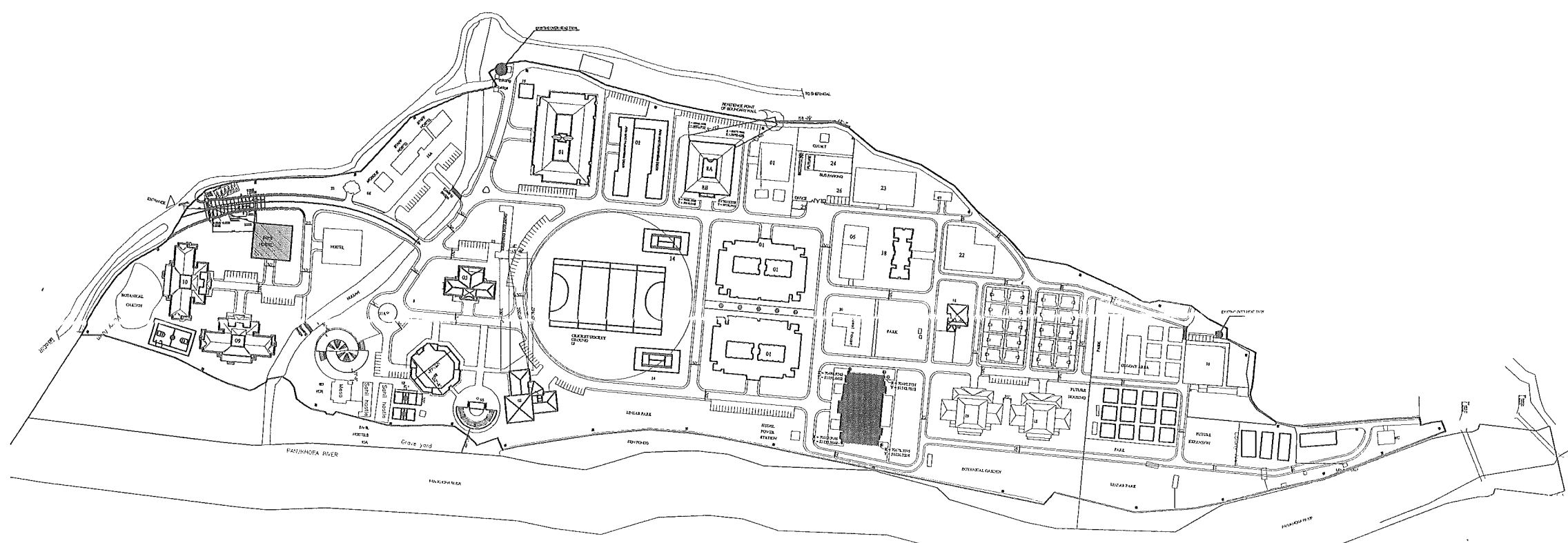
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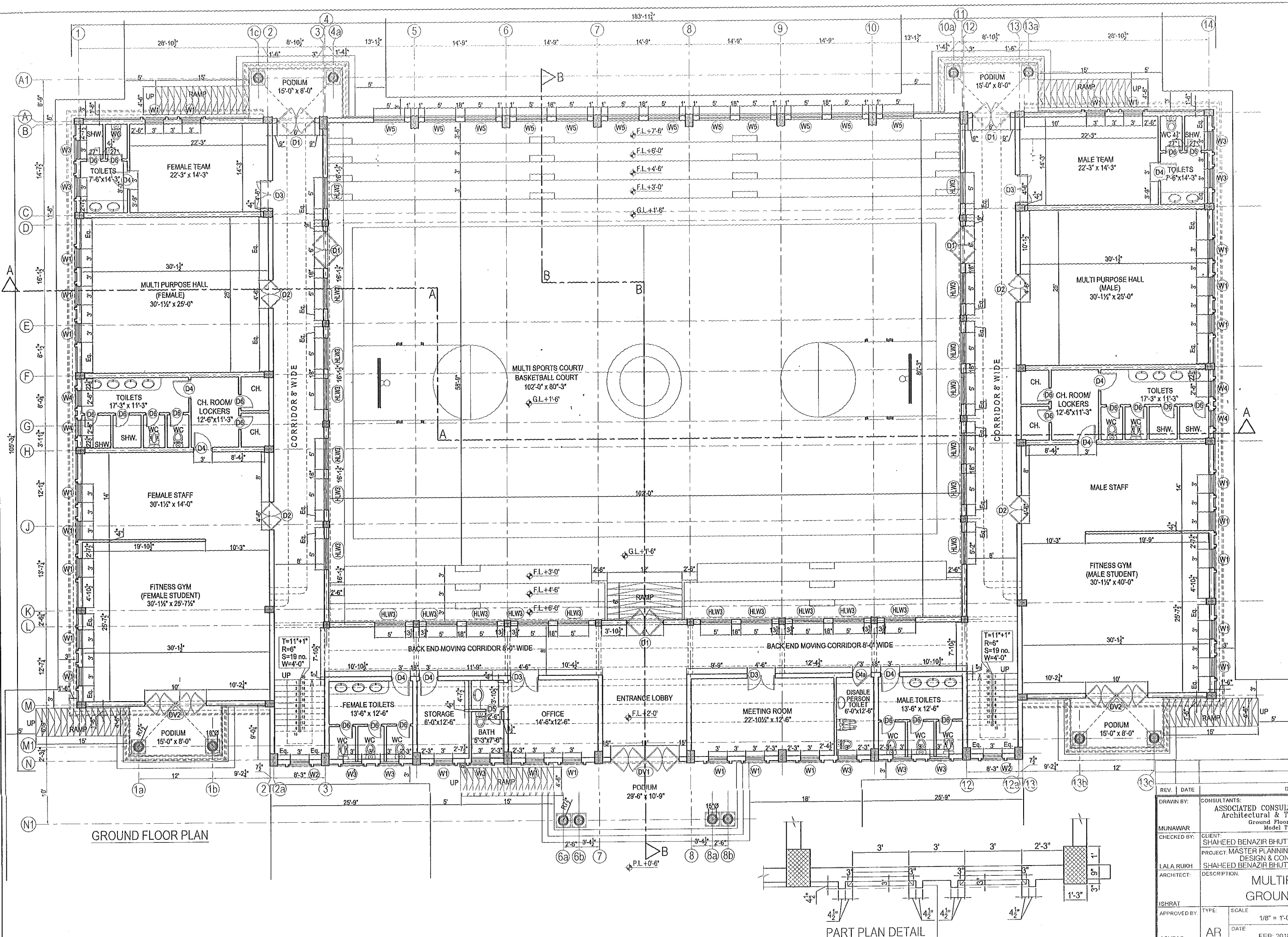
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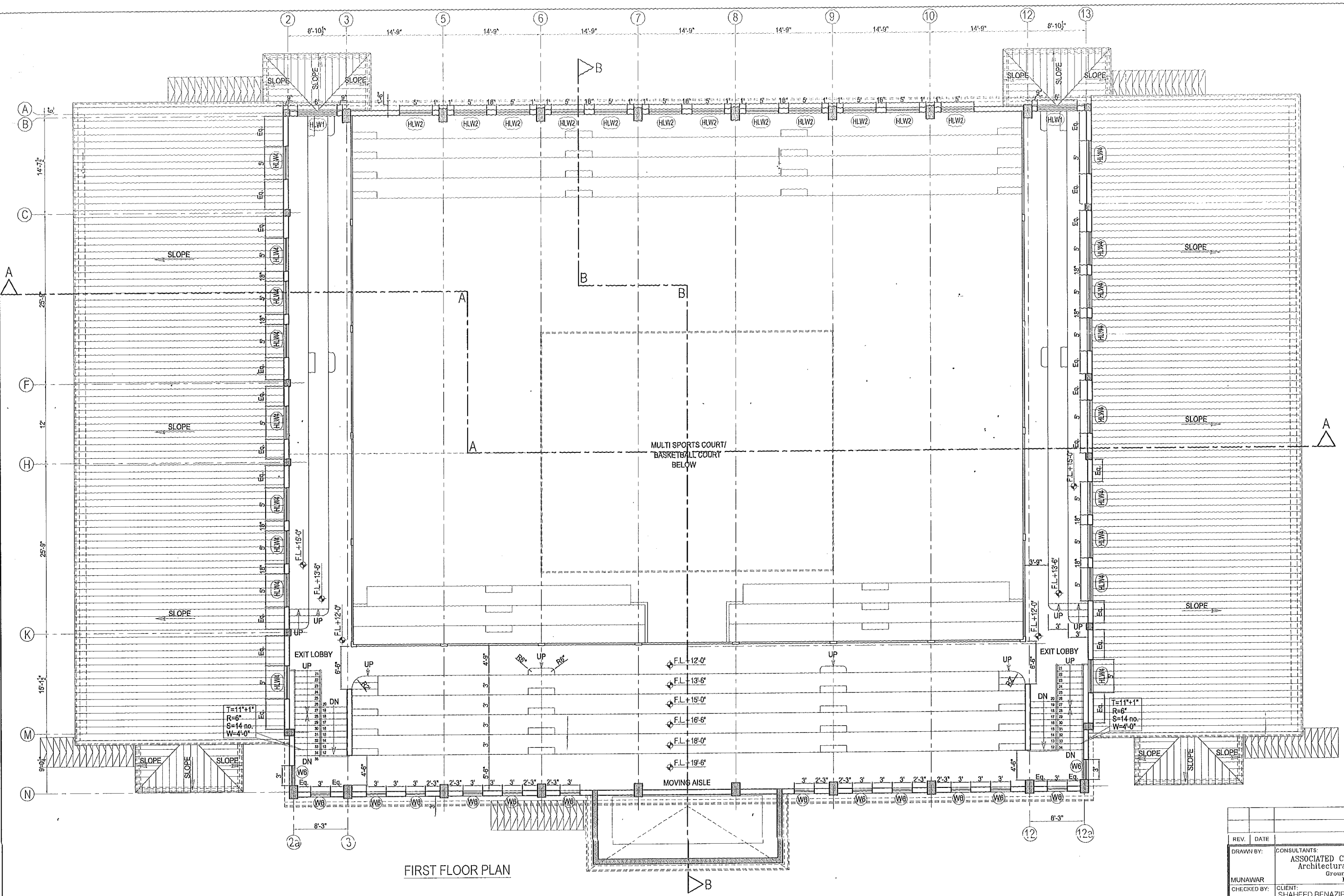
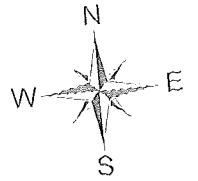
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CONSULTANTS:	ASSOCIATED CONSULTING ENGINEERS-ACE (PVT) LTD. Architectural & Town Planning Services, Section Ground Floor, 36 Civic Center, M-Block, Model Town Extension, Lahore
CLIENT:	SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER
PROJECT:	MASTER PLANNING ARCHITECTURAL, ENGINEERING DESIGN & CONSTRUCTION SUPERVISION OF SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER
ARCHITECT:	MULTIPURPOSE HALL LAYOUT PLAN WITH COORDINATES
APPROVED BY:	TYPE: AR SCALE: N.T.S. DATE: FEB: 2018
JOB NO.	6073
DRG NO.	SBBU-MPH-AR-01



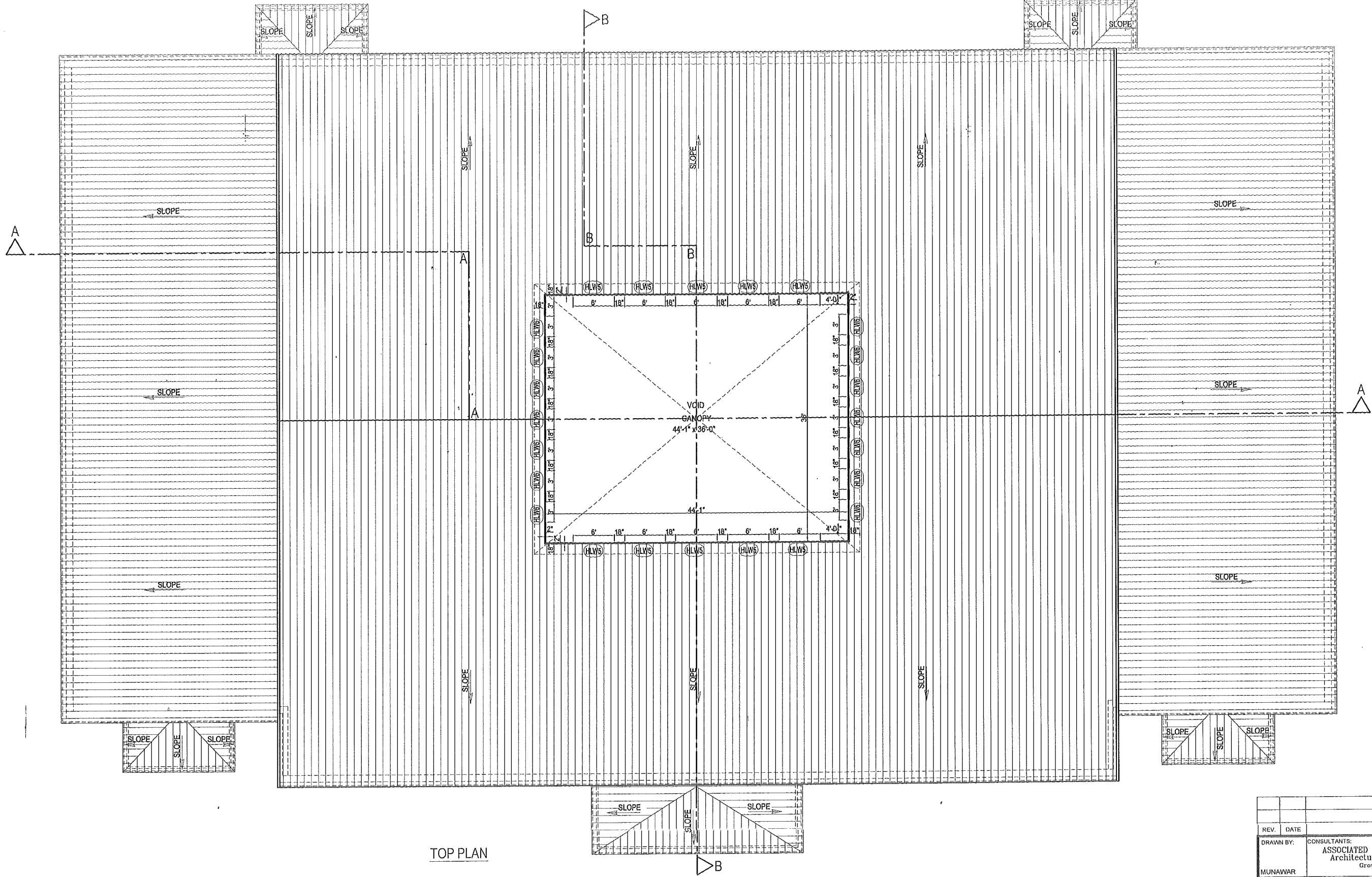
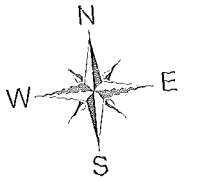
PART PLAN DETAIL

REV.	DATE	DESCRIPTION	DRN	CHKD
DRAWN BY:		CONSULTANTS:		
		ASSAULT CONSULTING ENGINEERS-ACE (PVT) LTD. Architectural & Town Planning Services, Section Ground Floor, 36 Civic Center, M-Block, Model Town Extension, Lahore		
MUNAWAR				
CHECKED BY:		CLIENT: SHAHEED ABASIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER		
		PROJECT: MASTER PLANNING ARCHITECTURAL ENGINEERING DESIGN & CONSTRUCTION SUPERVISION OF		
LALA RUKH		SHAHEED ABASIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER		
ARCHITECT:		DESCRIPTION:		
		MULTIPURPOSE HALL GROUND FLOOR PLAN		
ISHRAT				
APPROVED BY:	TYPE:	SCALE:	JOB NO.	DRG NO.
		1/8" = 1'-0"		
	DATE:	FEB: 2018	6073	SBBU-MPH-AR-02
ASHFAQ	AR			



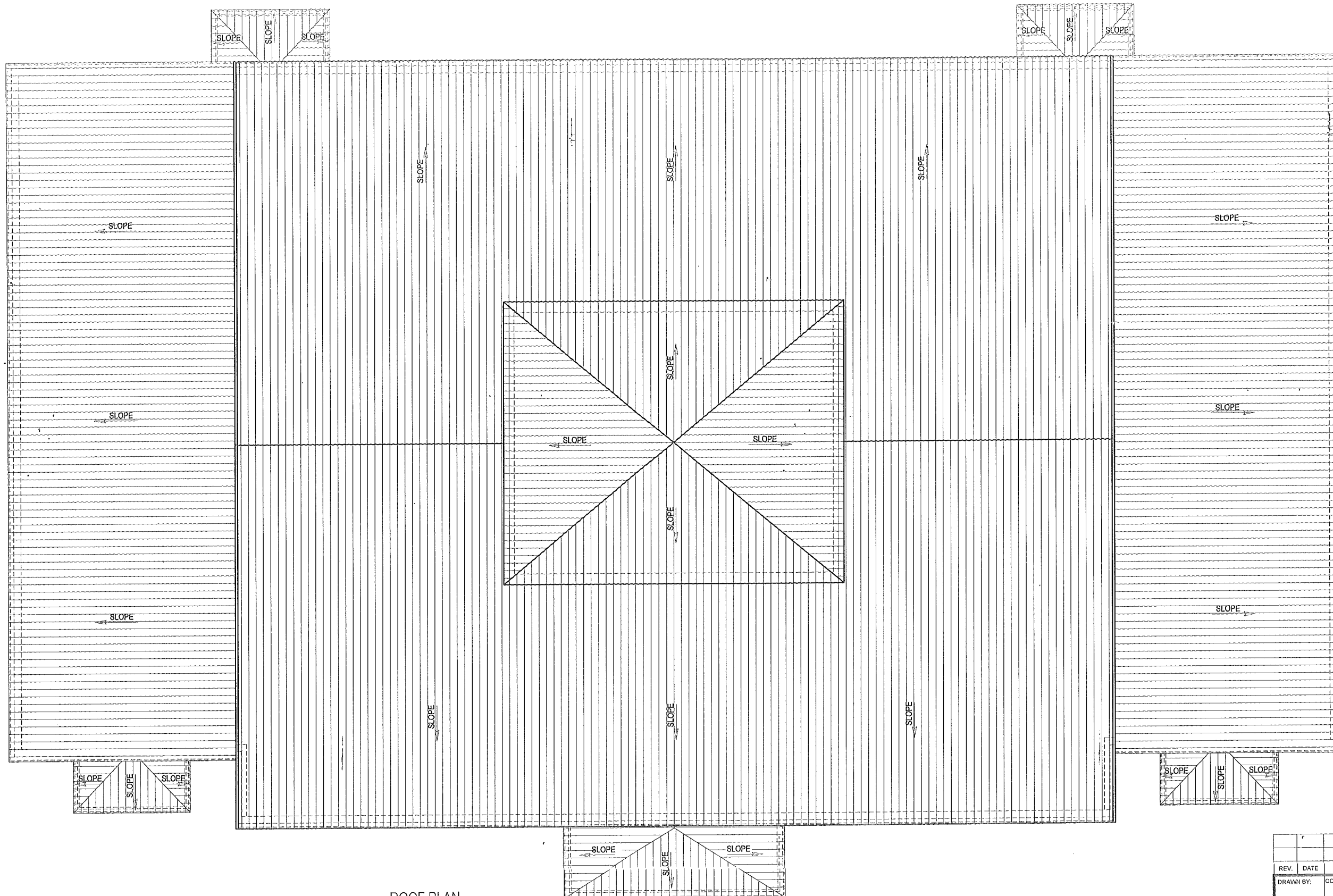
FIRST FLOOR PLAN

REV.	DATE	DESCRIPTION	DRN.	CHKD.
DRAWN BY:	CONSULTANTS: ASSOCIATED CONSULTING ENGINEERS-ACE (PVT) LTD. Architectural & Town Planning Services,Section Ground Floor, 36 Civic Center, M-Block, Model Town Extension, Lahore			
MUNAWAR				
CHECKED BY:	CLIENT: SHAHJEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER PROJECT: MASTER PLANNING ARCHITECTURAL, ENGINEERING DESIGN & CONSTRUCTION SUPERVISION OF SHAHJEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER			
LALA RUKH				
ARCHITECT:	DESCRIPTION: MULTIPURPOSE HALL FIRST FLOOR PLAN			
ISHRAT				
APPROVED BY	TYPE:	SCALE:	JOB NO.	DRG NO.
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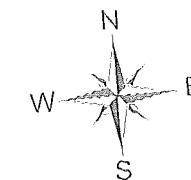


TOP PLAN

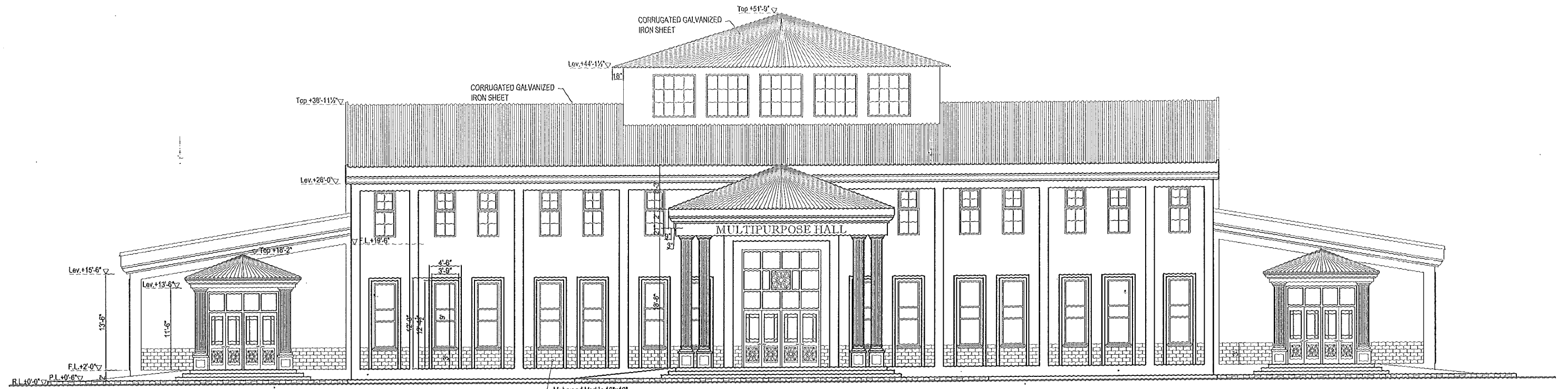
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DRAWN BY:	CONSULTANTS: ASSOCIATED CONSULTING ENGINEERS-ACE (PVT) LTD. Architectural & Town Planning Services, Section Ground Floor, 36 Civic Center, M-Block, Model Town Extension, Lahore			
MUNAWAR	CLIENT: SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER			
CHECKED BY:	PROJECT: MASTER PLANNING ARCHITECTURAL, ENGINEERING DESIGN & CONSTRUCTION SUPERVISION OF			
LALA RUKH	SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER			
ARCHITECT:	DESCRIPTION: MULTIPURPOSE HALL TOP PLAN			
ISHRAT				
APPROVED BY:	TYPE:	SCALE:	JOB NO.	DRG NO.
ASHFAQ	AR	1/8" = 1'-0"	6073	SBBU-MPH-AR-04
		DATE:		
		FEB: 2018		



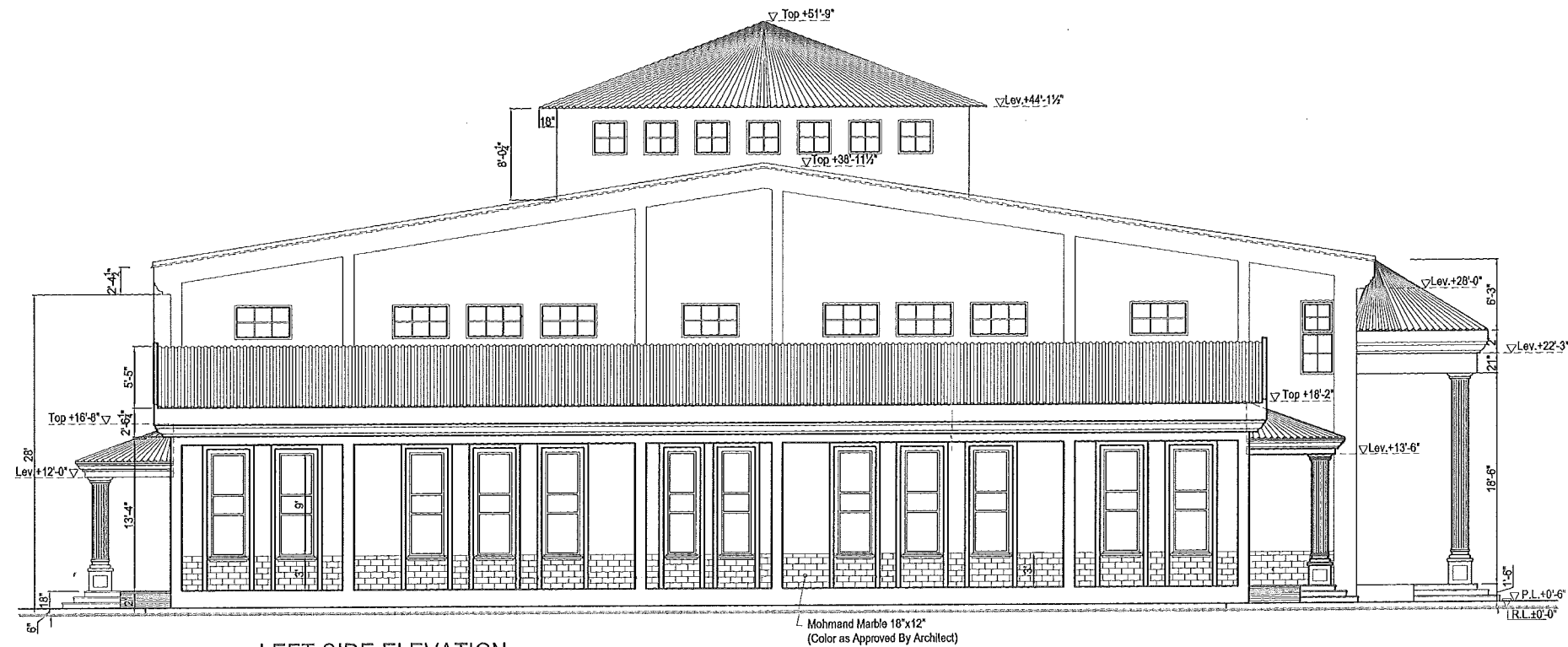
ROOF PLAN



REV.	DATE	DESCRIPTION	DRN	CHKD.
DRAWN BY: CONSULTANTS: ASSOCIATED CONSULTING ENGINEERS-ACE (PVT) LTD. Architectural & Town Planning Services, Section Ground Floor, 36 Civic Center, M-Block, Model Town Extension, Lahore				
CHECKED BY: CLIENT: SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER PROJECT: MASTER PLANNING ARCHITECTURAL, ENGINEERING DESIGN & CONSTRUCTION SUPERVISION OF SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER				
LALA RUKH ARCHITECT: DESCRIPTION: MULTIPURPOSE HALL ROOF PLAN				
APPROVED BY:		TYPE:	SCALE:	JOB NO.
ASHFAQ		AR	1/8" = 1'-0"	6073
		DATE:	FEB: 2018	SBBU-MPH-AR-05

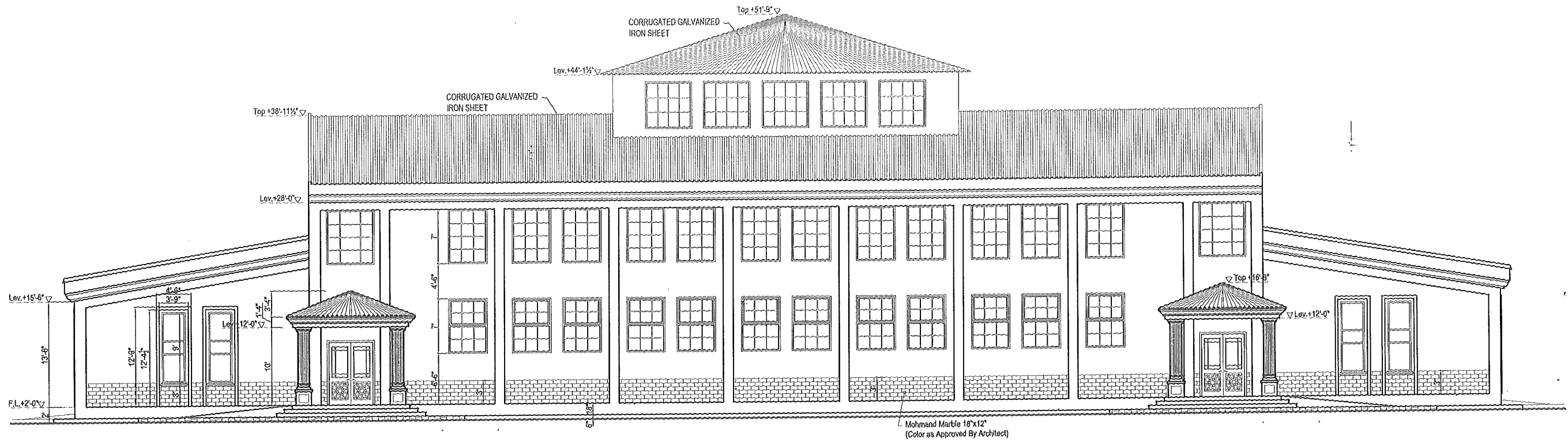


FRONT ELEVATION

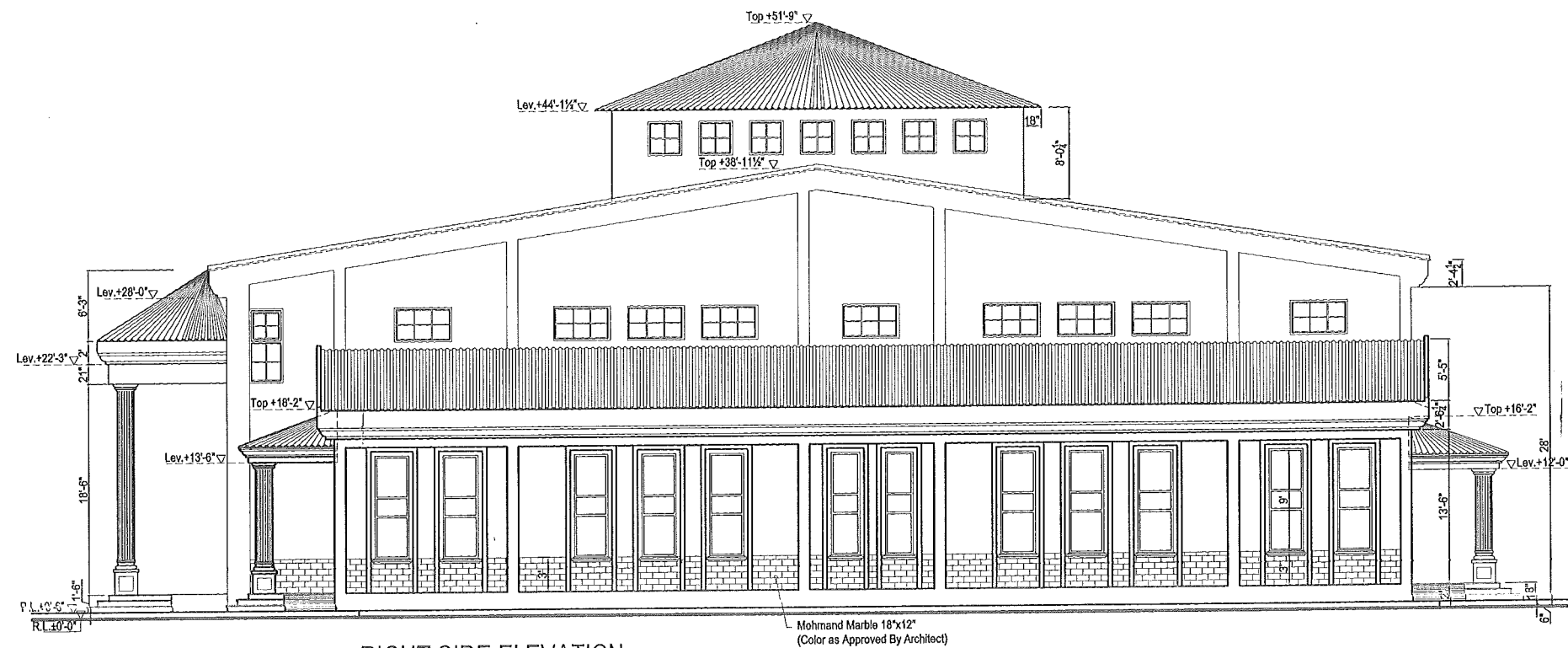


LEFT SIDE ELEVATION

REV.	DATE	DESCRIPTION	DRN	CHKD.
DRAWN BY:	CONSULTANTS: ASSOCIATED CONSULTING ENGINEERS-ACE (PVT) LTD. Architectural & Town Planning Services, Section Ground Floor, 36 Civic Center, M-Block, Model Town Extension, Lahore			
MUNAWAR	CLIENT: SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER			
CHECKED BY:	PROJECT: MASTER PLANNING ARCHITECTURAL, ENGINEERING DESIGN & CONSTRUCTION SUPERVISION OF			
LALA RUKH	SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER			
ARCHITECT:	DESCRIPTION: MULTIPURPOSE HALL ELEVATIONS			
ISHRAT				
APPROVED BY:	TYPE: AR	SCALE: 1/8" = 1'-0"	JOB NO. 6073	DRG NO. SBBU-MPH-AR-06
ASHFAQ		DATE: FEB. 2018		

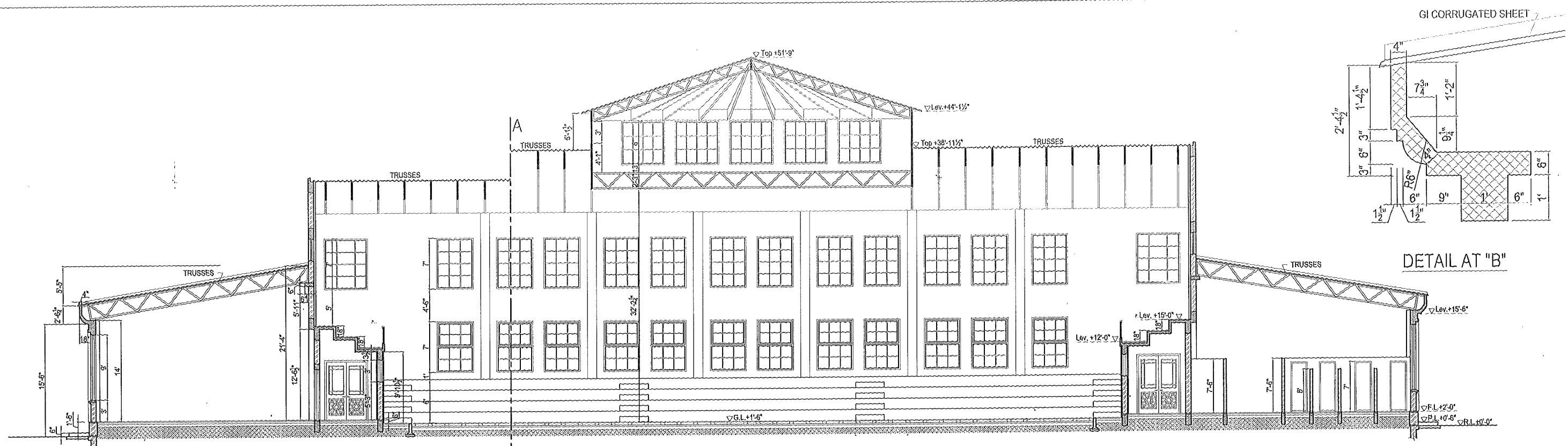


REAR ELEVATION

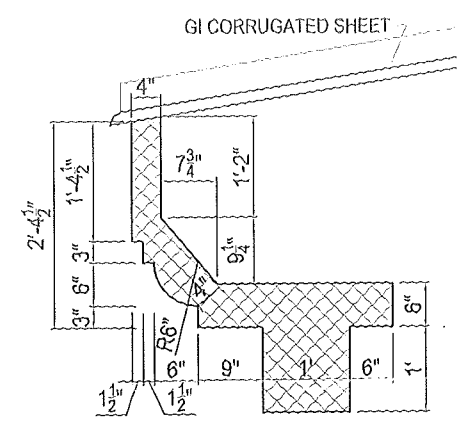


RIGHT SIDE ELEVATION

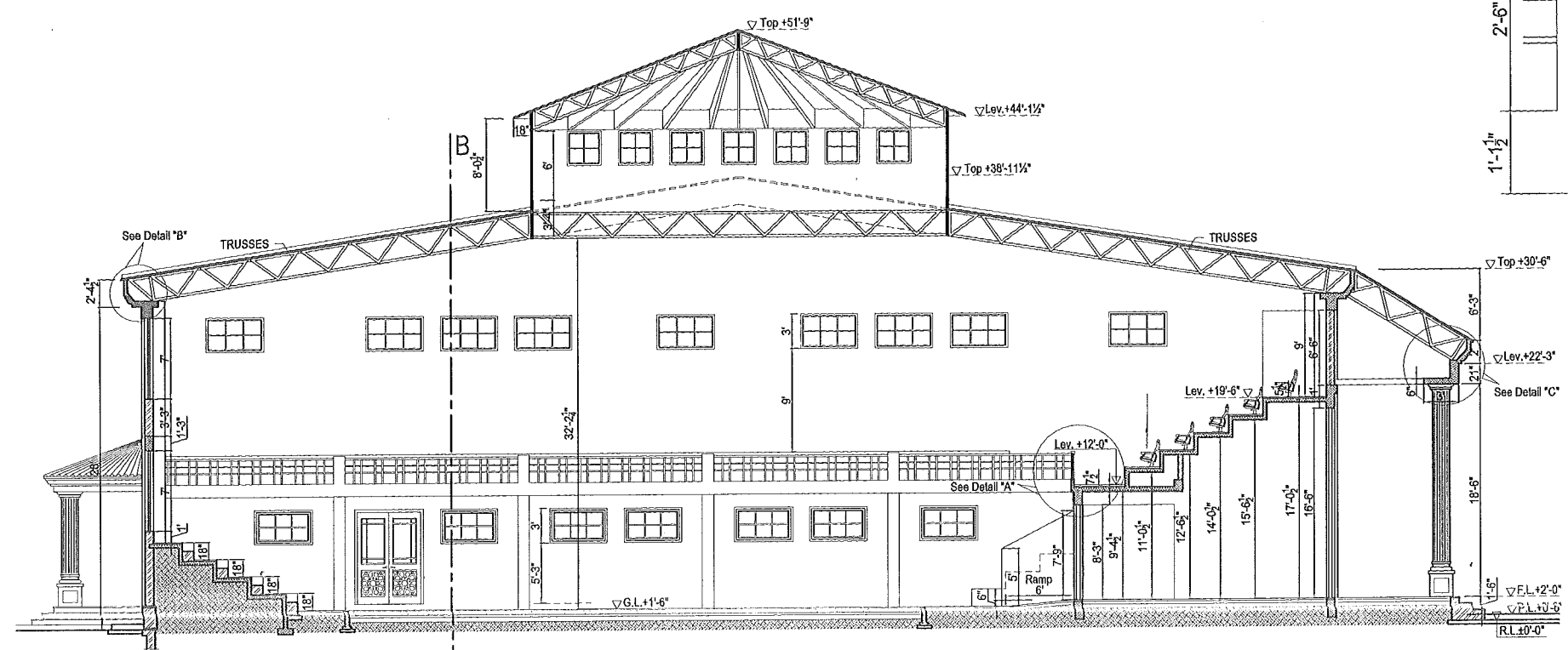
REV.	DATE	DESCRIPTION	DRN	CHKD
DRAWN BY:	CONSULTANTS: ASSOCIATED CONSULTING ENGINEERS-ACE (PVT) LTD. Architectural & Town Planning Services, Section Ground Floor, 36 Civic Center, M-Block, Model Town Extension, Lahore			
MUNAWAR	CLIENT: SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER			
CHECKED BY:	PROJECT: MASTER PLANNING ARCHITECTURAL ENGINEERING DESIGN & CONSTRUCTION SUPERVISION OF			
LALA RUKH	SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER			
ARCHITECT:	DESCRIPTION: MULTIPURPOSE HALL ELEVATIONS			
ISHRAT				
APPROVED BY:	TYPE:	SCALE:	JOB NO:	DRG NO:
ASHFAQ	AR	1/8" = 1'-0"	6073	SBBU-MPH-AR-07
		DATE:	FEB. 2018	



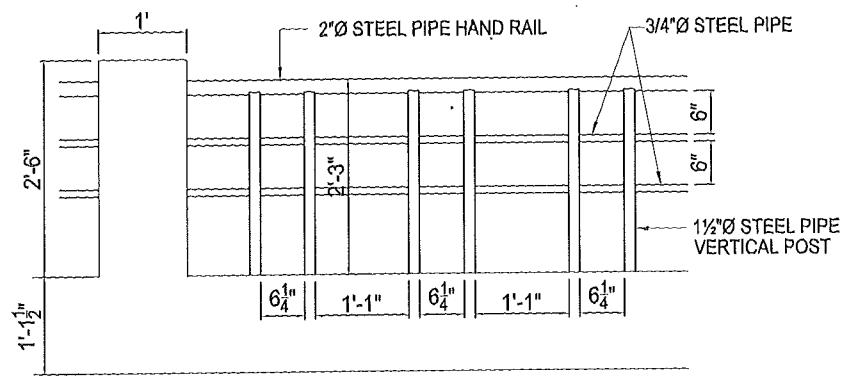
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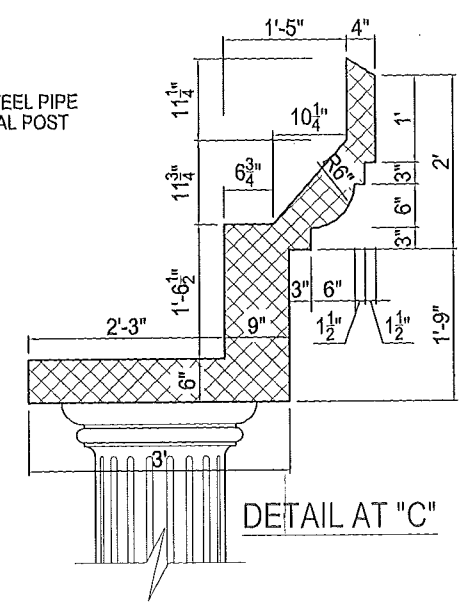
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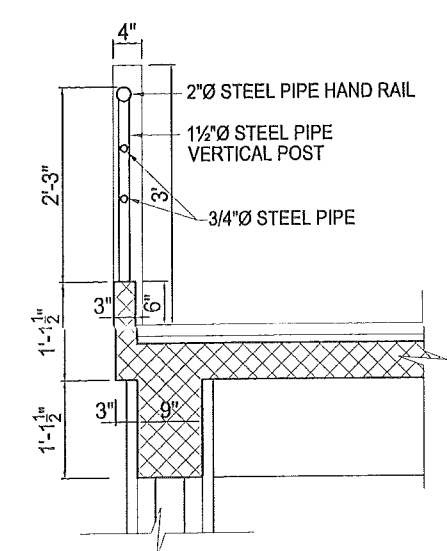
SECTION AT B-B



ELEVATION DETAIL AT-A

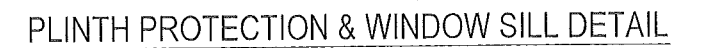


DETAIL AT "C"

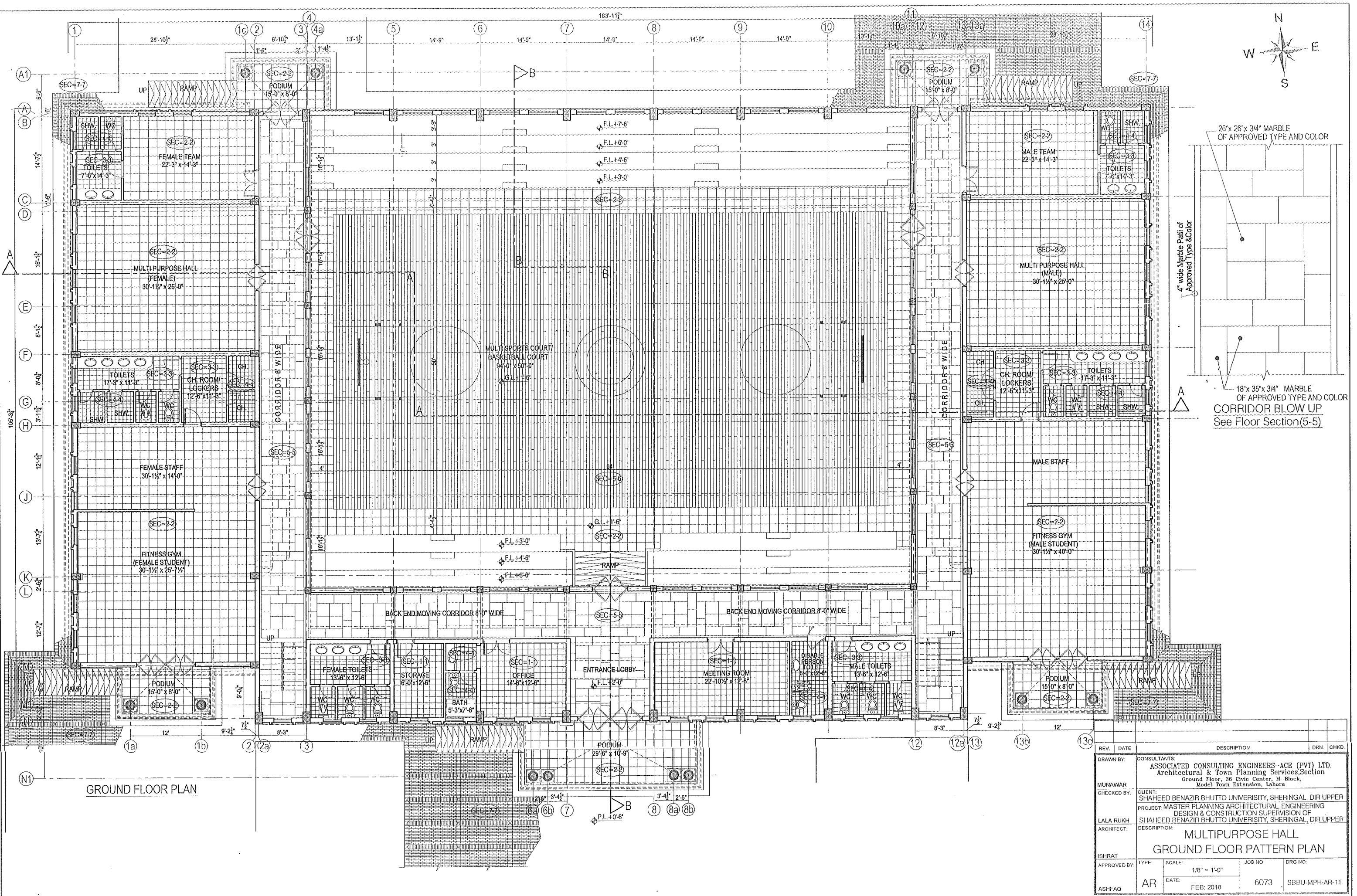


SECTIONAL DETAIL AT-A

REV.	DATE	DESCRIPTION	DRN	CHKD.
DRAWN BY: CONSULTANTS: ASSOCIATED CONSULTING ENGINEERS-ACE (PVT) LTD. Architectural & Town Planning Services, Section Ground Floor, 36 Civic Center, M-Block, Model Town Extension, Lahore				
CHECKED BY: CLIENT: SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER PROJECT: MASTER PLANNING ARCHITECTURAL ENGINEERING DESIGN & CONSTRUCTION SUPERVISION OF SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER				
ARCHITECT: DESCRIPTION: MULTIPURPOSE HALL SECTIONS				
APPROVED BY:	TYPE:	SCALE:	JOB NO.	DRG NO.
ASHFAQ	AR	1/8" = 1'-0"	6073	SBSU-MPH-AR-03
		DATE:		
		FEB: 2018		

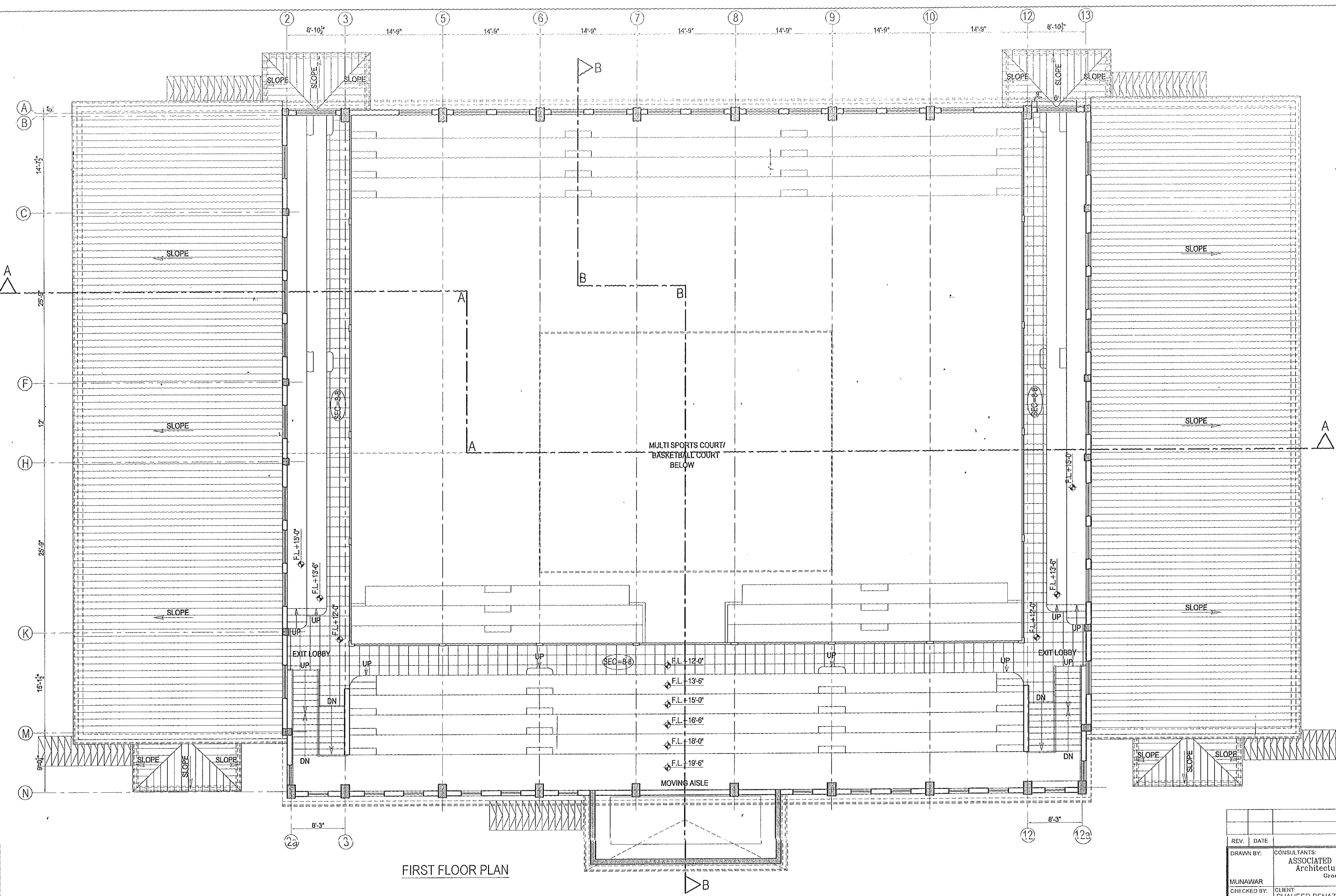
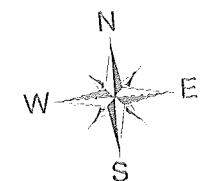


REV.	DATE	DESCRIPTION						DWN.	CHKD.
DRAWN BY:		CONSULTANTS: ASSOCIATED CONSULTING ENGINEERS-ACE (PVT) LTD. Architectural & Town Planning Services, Section Ground Floor, 36 Civic Center, M-Block, Model Town Extension, Lahore							
MUNAWAR	CHECKED BY:	CLIENT: SHAHEED BAZIR BHUTTO UNIVERISITY, SHERINAL, DIR UPPER PROJECT MASTER PLANNING ARCHITECTURAL, ENGINEERING DESIGN & CONSTRUCTION SUPERVISION OF SHAHEED BAZIR BHUTTO UNIVERISITY, SHERINAL, DIR UPPER							
LALA RUKH	ARCHITECT:	DESCRIPTION: MULTIPURPOSE HALL PODIUM COLUMN DETAILS							
ISHRAT	APPROVED BY:	TYPE:	SCALE:	JOB NO	DRG NO				
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ASHFAQ			DATE:	FEB 2018					

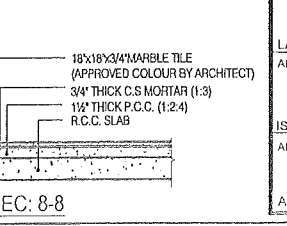
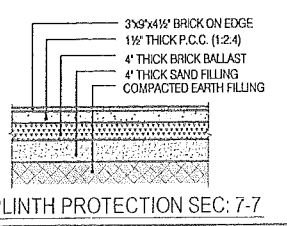
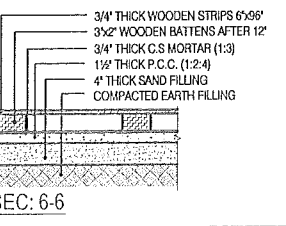
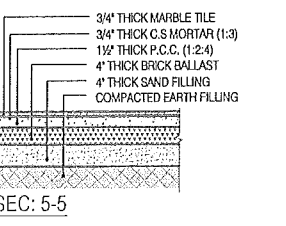
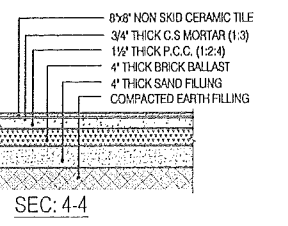
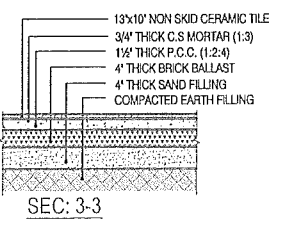
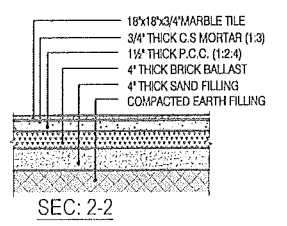
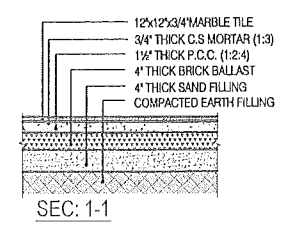


GROUND FLOOR PLAN

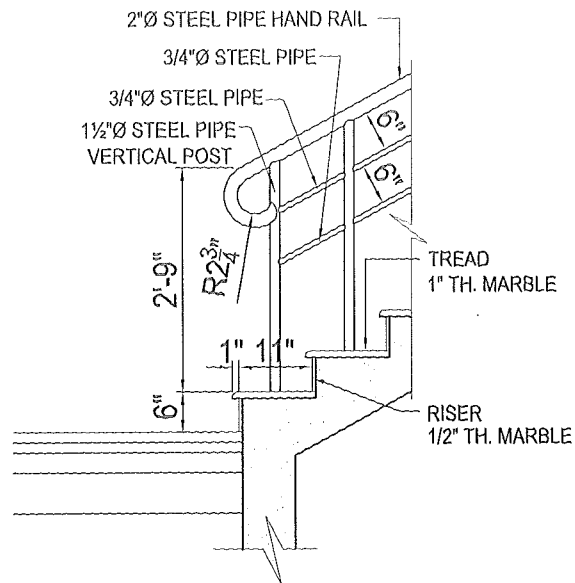
REV.	DATE	DESCRIPTION	DRN.	CHKD.
DRAWN BY: CONSULTANTS: ASSOCIATED CONSULTING ENGINEERS-ACE (PVT) LTD. Architectural & Town Planning Services,Section Ground Floor, 36 Civic Center, M-Block, Model Town Extension, Lahore				
MUNAWAR				
CHECKED BY: CLIENT: SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER				
LALA RUKH				
ARCHITECT: PROJECT: MASTER PLANNING ARCHITECTURAL, ENGINEERING DESIGN & CONSTRUCTION SUPERVISION OF SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER				
DESCRIPTION: MULTIPURPOSE HALL				
ISHRAT				
APPROVED BY: TYPE: SCALE: 1/8" = 1'-0" JOB NO: DRG NO:				
ASHFAQ AR DATE: FEB. 2018 6073 SBBU-MPH-AR-11				



FIRST FLOOR PLAN

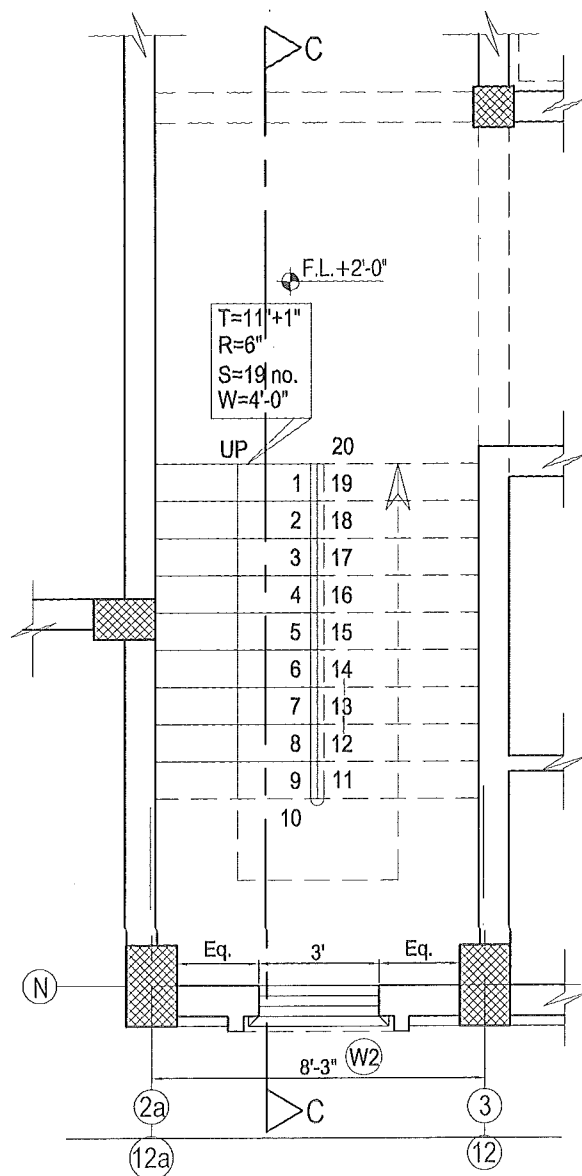


REV.	DATE	DESCRIPTION	DRN.	CHKD.
DRAWN BY:	CONSULTANTS: ASSOCIATED CONSULTING ENGINEERS-ACE (PVT) LTD. Architectural & Town Planning Services, Section Ground Floor, 36 Civic Center, M-Block, Model Town Extension, Lahore			
MUNAWAR	CLIENT: SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER			
CHECKED BY:	PROJECT: MASTER PLANNING ARCHITECTURAL, ENGINEERING DESIGN & CONSTRUCTION SUPERVISION OF SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER			
LALA RUKH	DESCRIPTION: MULTIPURPOSE HALL FIRST FLOOR PATTERN PLAN			
ARCHITECT:				
ISHRAT				
APPROVED BY:	TYPE:	SCALE:	JOB NO.	DRG NO.
ASHFAQ	AR	1/8" = 1'-0"	6073	SBBU-MPH-AR-12
		DATE:		
		FEB: 2018		

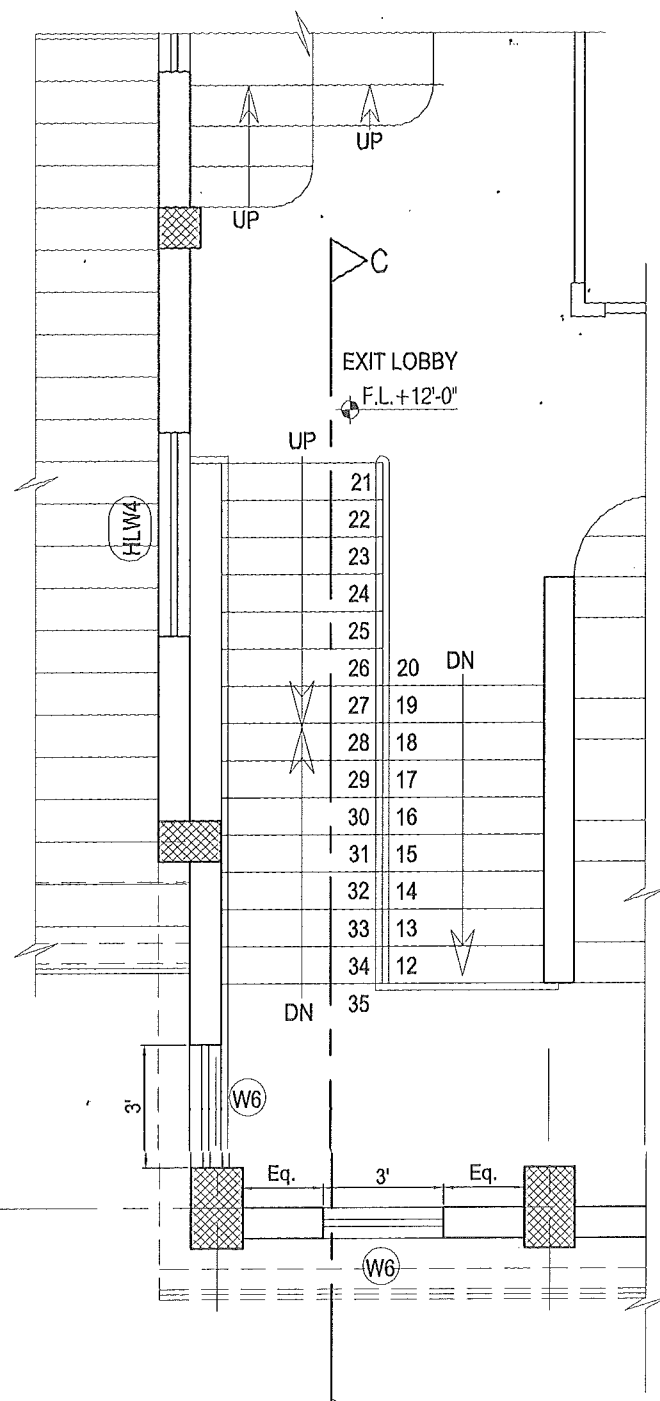


RAILING & STEP DETAIL

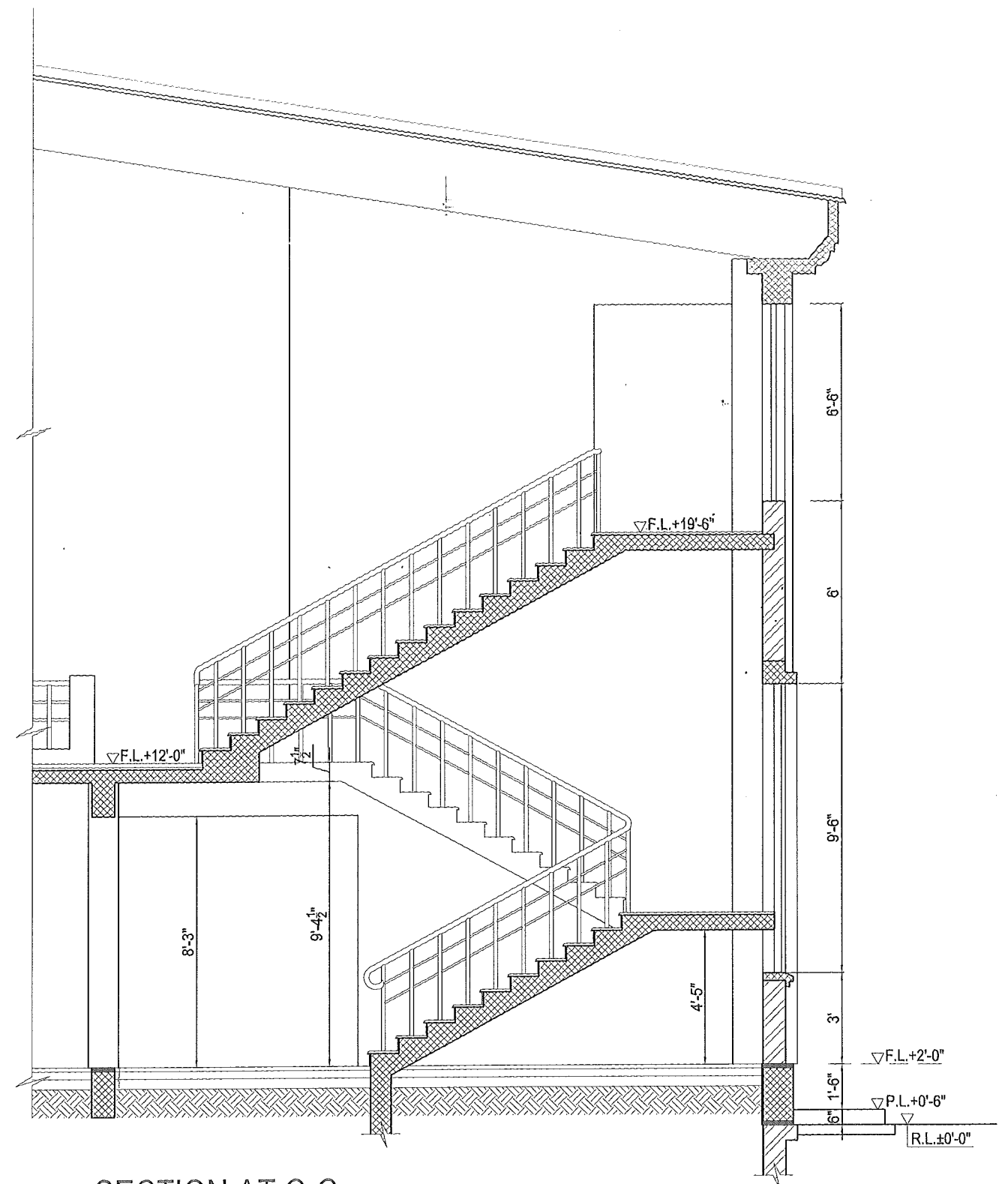
SCALE: 3/4"=1'-0"



G.F. PLAN

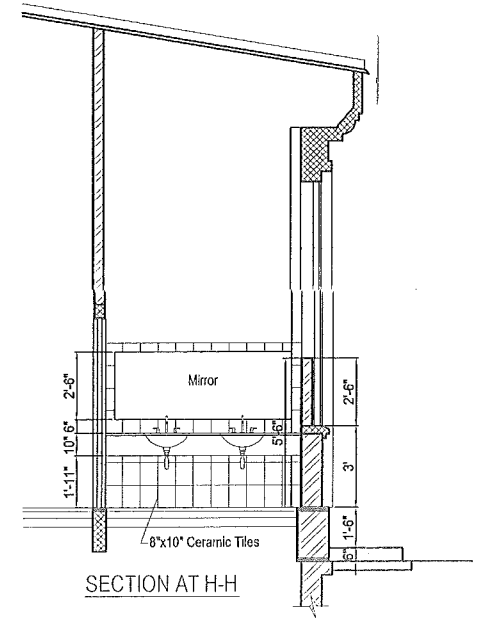
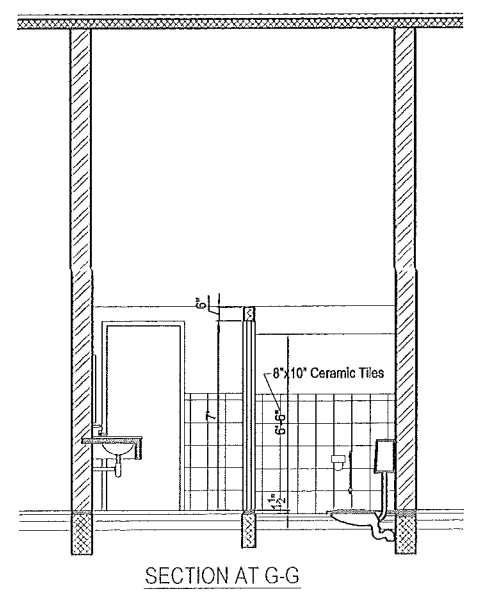
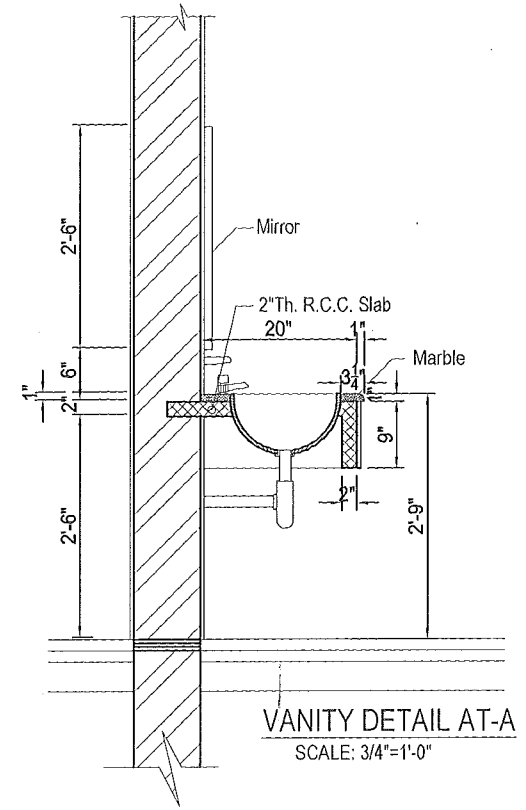
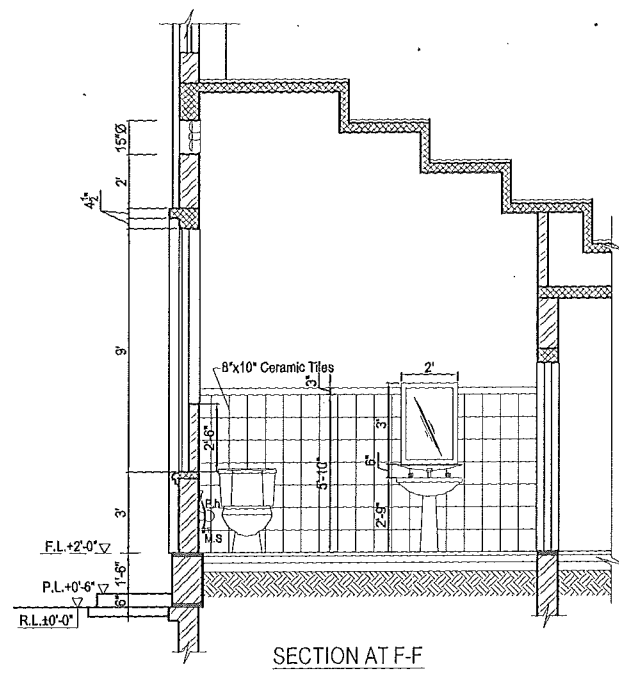
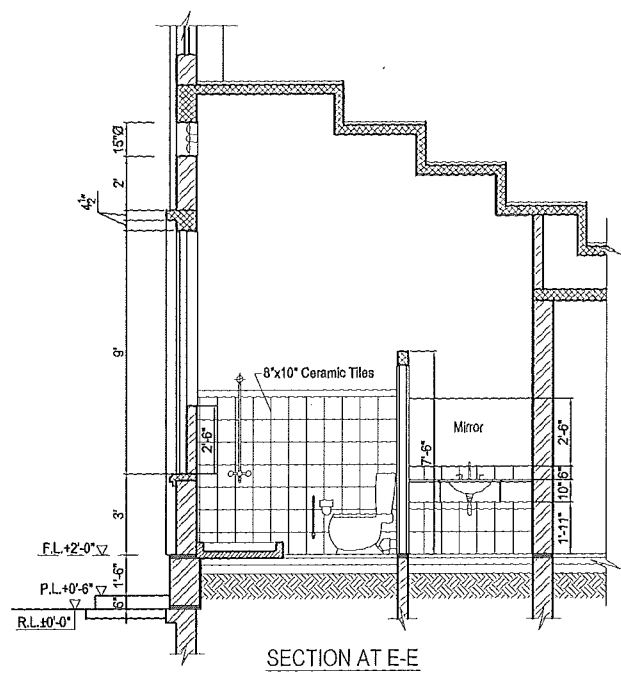
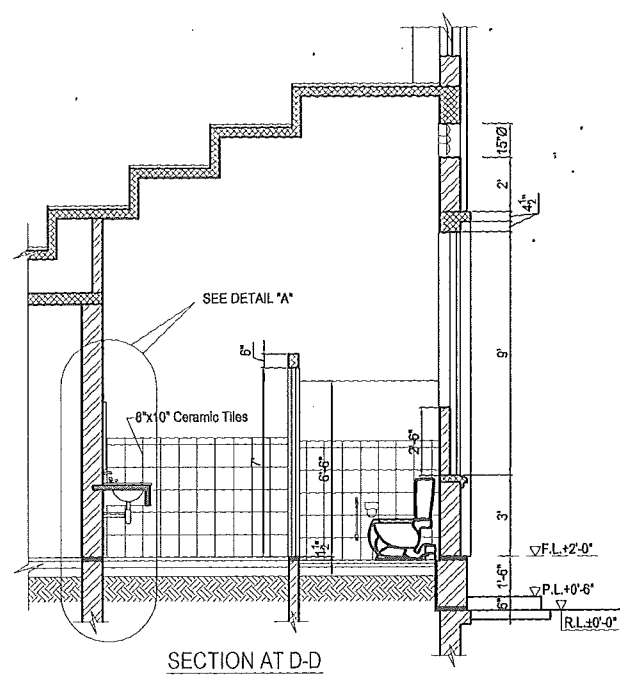
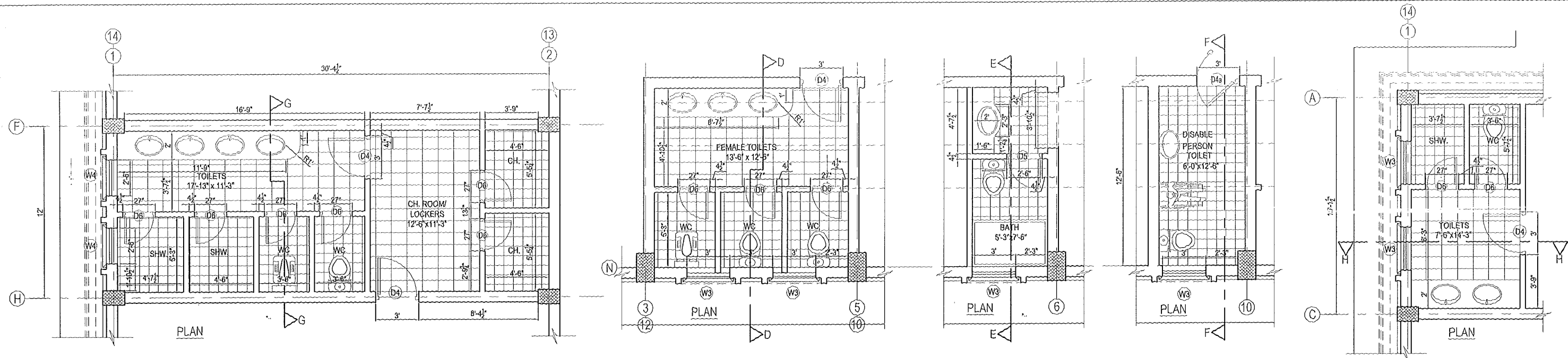


F.F. PLAN



SECTION AT C-C

REV.	DATE	DESCRIPTION	DRN.	CHKD.
DRAWN BY:	MUNAWAR	CONSULTANTS: ASSOCIATED CONSULTING ENGINEERS-ACE (PVT) LTD. Architectural & Town Planning Services, Section Ground Floor, 36 Civic Center, M-Block, Model Town Extension, Lahore		
CHECKED BY:	LALA RUKH	CLIENT: SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER PROJECT: MASTER PLANNING ARCHITECTURAL, ENGINEERING DESIGN & CONSTRUCTION SUPERVISION OF SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER		
ARCHITECT:	ISHRAT	DESCRIPTION: MULTIPURPOSE HALL STAIR DETAIL		
APPROVED BY:	ASHFAQ	TYPE: AR	SCALE: 3/8" = 1'-0"	JOB NO: 6073
		DATE: FEB: 2018		DRG NO: SBBU-MPH-AR-13



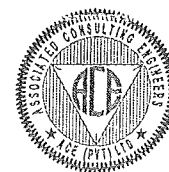
REV.	DATE	DESCRIPTION	DRN.	CHKD.
DRAWN BY: CONSULTANTS: ASSOCIATED CONSULTING ENGINEERS-ACE (PVT) LTD. Architectural & Town Planning Services, Section Ground Floor, 36 Civic Center, M-Block, Model Town Extension, Lahore				
CHECKED BY: CLIENT: SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER				
PROJECT: MASTER PLANNING ARCHITECTURAL, ENGINEERING DESIGN & CONSTRUCTION SUPERVISION OF SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER				
ARCHITECT: DESCRIPTION: MULTIPURPOSE HALL				
TOTLETS PLAN & SECTIONAL DETAIL				
ISHRAT	APPROVED BY:	TYPE: AR	SCALE: 1/4" = 1'-0"	JOB NO. 6073
ASHFAQ	DATE: FEB. 2018			DIRG NO. SBBU-MPH-AR-14

TENDER DRAWINGS
FOR
MULTIPURPOSE HALL
DEVELOPMENT OF UNIVERSITY OF DIR,
SHERINGAL, DIR UPPER

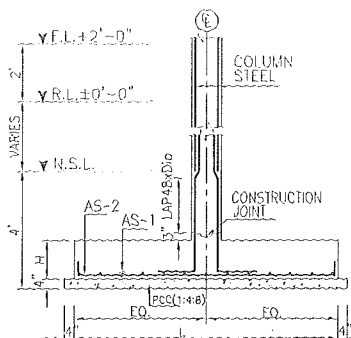
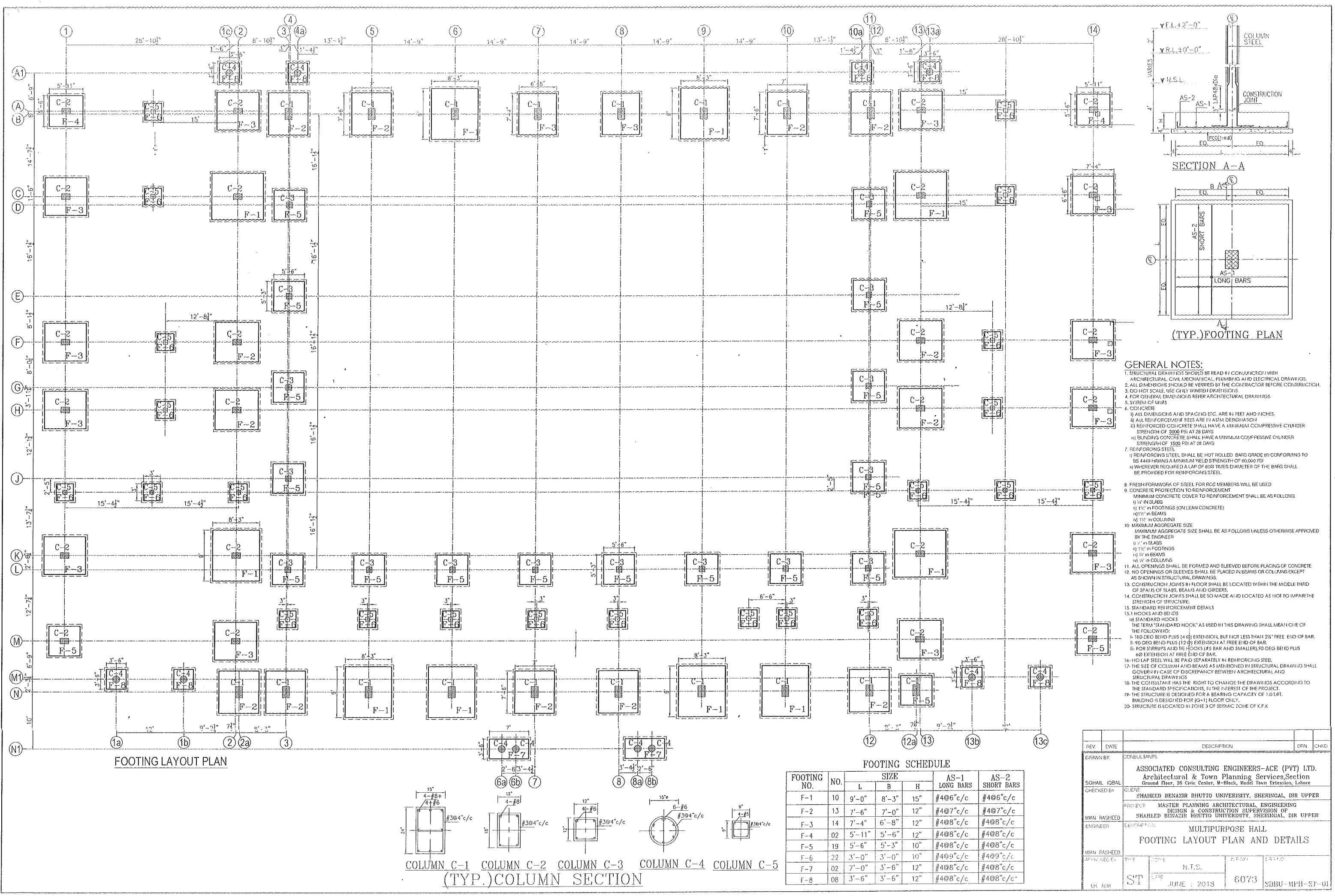
SR. NO.	DESCRIPTION	DRG. NO.
STRUCTURAL		
1	TITLE SHEET	SBBU-MPH-ST-00
2	FOOTING LAYOUT PLAN & DETAILS	SBBU-MPH-ST-01
3	PLINTH BEAM LAYOUT PLAN & DETAILS	SBBU-MPH-ST-02
4	GROUND FLOOR ROOF BEAM FRAMING PLAN	SBBU-MPH-ST-03
5	SECTION SHOWN REINFORCEMENT	SBBU-MPH-ST-04
6	FIRST FLOOR ROOF BEAM FRAMING PLAN	SBBU-MPH-ST-05
7	REINFORCEMENT DETAIL OF GROUND FLOOR ROOF BEAM & SECTIONS	SBBU-MPH-ST-06
8	REINFORCEMENT DETAIL OF GROUND FLOOR ROOF BEAM & SECTIONS	SBBU-MPH-ST-07
9	REINFORCEMENT DETAIL OF GROUND FLOOR ROOF BEAM & SECTIONS	SBBU-MPH-ST-08
10	REINFORCEMENT DETAIL OF GROUND FLOOR ROOF BEAM B-4 B-14 & SECTION	SBBU-MPH-ST-09
11	REINFORCEMENT DETAIL OF GROUND FLOOR ROOF BEAM B-16 & SECTION	SBBU-MPH-ST-10

Tender Drawings

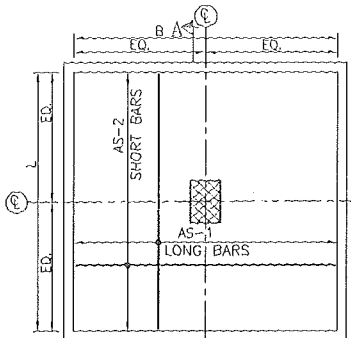
AUGUST. 2018
CONSULTANTS



ASSOCIATED CONSULTING ENGINEERS-ACE (PVT) LTD.
Architectural & Town Planning Services Section
Ground Floor, 36 Civic Center, M-Block,
Model Town Extension, Lahore



SECTION A-A



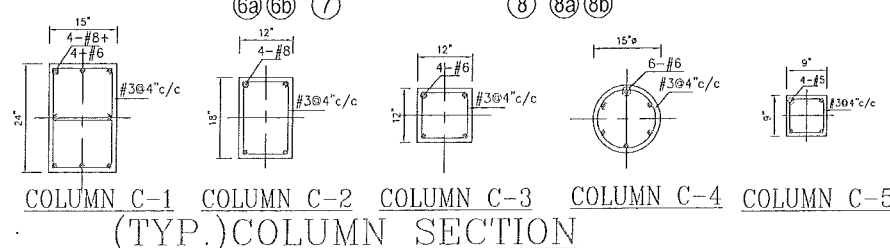
(TYP.) FOOTING PLAN

- GENERAL NOTES:**
- 1. STRUCTURAL DRAWINGS SHOULD BE READ IN CONJUNCTION WITH ARCHITECTURAL, CIVIL, MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS.
 - 2. ALL DIMENSIONS SHOULD BE VERIFIED BY THE CONTRACTOR BEFORE CONSTRUCTION.
 - 3. DO NOT SCALE, USE ONLY WRITTEN DIMENSIONS.
 - 4. FOR GENERAL DIMENSIONS REFER ARCHITECTURAL DRAWINGS.
 - 5. SYSTEM OF UNITS
 - 6. CONCRETE
 - i) ALL DIMENSIONS AND SPACING ETC. ARE IN FEET AND INCHES.
 - ii) ALL REINFORCEMENT SIZES ARE IN ASTM DESIGNATION
 - iii) REINFORCED CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE CYLINDER STRENGTH OF 3000 PSI AT 28 DAYS
 - iv) SLAB/BEAM CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE CYLINDER STRENGTH OF 1500 PSI AT 28 DAYS
 - 7. REINFORCING STEEL
 - i) REINFORCING STEEL SHALL BE HOT ROLLED BARS GRADE 60 CONFORMING TO BS 4449 HAVING A MINIMUM YIELD STRENGTH OF 60,000 PSI
 - ii) WHEREVER REQUIRED A LAP OF 600 TIMES DIAMETER OF THE BARS SHALL BE PROVIDED FOR REINFORCING STEEL
 - 8. FRESH FORMWORK OF STEEL FOR RCC MEMBERS WILL BE USED
 - 9. CONCRETE PROTECTION TO REINFORCEMENT
 - i) MINIMUM CONCRETE COVER TO REINFORCEMENT SHALL BE AS FOLLOWS
 - ii) 3/4" IN SLABS
 - iii) 1 1/2" IN FOOTINGS (ON LEAN CONCRETE)
 - iv) 1 1/2" IN BEAMS
 - v) 1 1/2" IN COLUMNS
 - ii) MAXIMUM AGGREGATE SIZE SHALL BE AS FOLLOWS UNLESS OTHERWISE APPROVED BY THE ENGINEER
 - iii) 1/2" IN SLABS
 - iv) 1 1/2" IN FOOTINGS
 - v) 3/4" IN BEAMS
 - vi) 3/4" IN COLUMNS
 - 11. ALL OPENINGS SHALL BE FORMED AND SLEEVED BEFORE PLACING OF CONCRETE
 - 12. NO OPENINGS OR SLEEVES SHALL BE PLACED IN BEAMS OR COLUMNS EXCEPT AS SHOWN IN STRUCTURAL DRAWINGS
 - 13. CONSTRUCTION JOINTS IN FLOOR SHALL BE LOCATED WITHIN THE MIDDLE THIRD OF SPANS OF SLABS, BEAMS AND GIRDERS
 - 14. CONSTRUCTION JOINTS SHALL BE SO MADE AND LOCATED AS NOT TO IMPAIR THE STRENGTH OF STRUCTURE
 - 15. STANDARD REINFORCEMENT DETAILS
 - 15.1 HOOKS AND BENDS
 - i) STANDARD HOOKS
 - THE TERM "STANDARD HOOK" AS USED IN THIS DRAWING SHALL MEAN ONE OF THE FOLLOWING:
 - 1- 180-DEG BEND PLUS (4 D) EXTENSION, BUT NOT LESS THAN 2/3" FREE END OF BAR.
 - 2- 90-DEG BEND PLUS (12 D) EXTENSION AT FREE END OF BAR.
 - 3- FOR STIRRUPS AND THE HOOKS (#3 BAR AND SMALLER), 90-DEG BEND PLUS 6D EXTENSION AT FREE END OF BAR.
 - ii) NO LAP STEEL WILL BE PAID SEPARATELY IN REINFORCING STEEL
 - 16. THE SIZE OF COLUMN AND BEAMS AS MENTIONED IN STRUCTURAL DRAWING SHALL GOVERN IN CASE OF DISCREPANCY BETWEEN ARCHITECTURAL AND STRUCTURAL DRAWINGS
 - 17. THE CONSULTANT HAS THE RIGHT TO CHANGE THE DRAWINGS ACCORDING TO THE STANDARD SPECIFICATIONS, IN THE INTEREST OF THE PROJECT.
 - 18. THE STRUCTURE IS DESIGNED FOR A BEARING CAPACITY OF 1.0 T/FT.
 - 19. BUILDING IS DESIGNED FOR (G+1) FLOOR ONLY.
 - 20. STRUCTURE IS LOCATED IN ZONE 3 OF SEISMIC ZONE OF K.P.K.

FOOTING LAYOUT PLAN

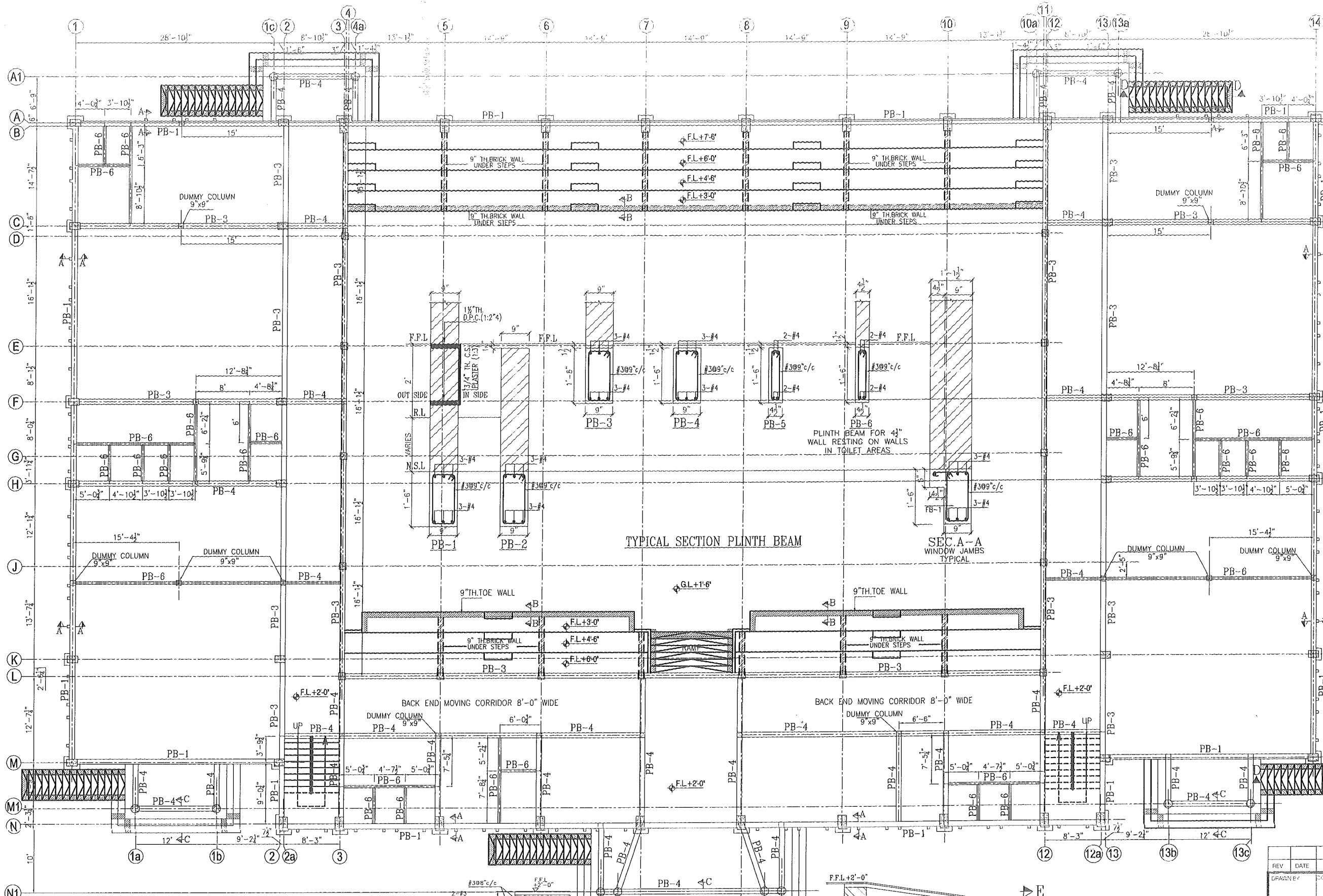
FOOTING SCHEDULE

FOOTING NO.	NO.	SIZE			AS-1 LONG BARS	AS-2 SHORT BARS
		L	B	H		
F-1	10	9'-0"	8'-3"	15"	#4@6"c/c	#4@6"c/c
F-2	13	7'-6"	7'-0"	12"	#4@7"c/c	#4@7"c/c
F-3	14	7'-4"	6'-8"	12"	#4@8"c/c	#4@8"c/c
F-4	02	5'-11"	5'-6"	12"	#4@8"c/c	#4@8"c/c
F-5	19	5'-6"	5'-3"	10"	#4@8"c/c	#4@8"c/c
F-6	22	3'-0"	3'-0"	10"	#4@9"c/c	#4@9"c/c
F-7	02	7'-0"	3'-6"	12"	#4@8"c/c	#4@8"c/c
F-8	08	3'-6"	3'-6"	12"	#4@8"c/c	#4@8"c/c

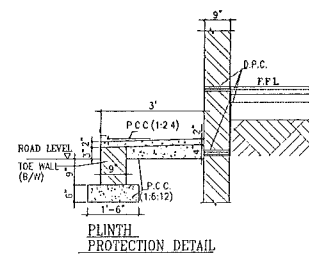


(TYP.) COLUMN SECTION

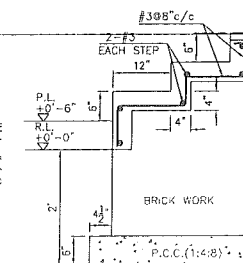
REV.	DATE	DESCRIPTION	DRN	CHKD
CONSULTANTS:				
ASSOCIATED CONSULTING ENGINEERS-ACE (PVT) LTD.				
Architectural & Town Planning Services, Section				
Ground Floor, 36 Civic Center, M-Block, Model Town Extension, Lahore				
CLIENT:				
SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER				
PROJECT:				
MASTER PLANNING ARCHITECTURAL, ENGINEERING				
DESIGN & CONSTRUCTION SUPERVISION OF				
SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER				
DESCRIPTION:				
MULTIPURPOSE HALL				
FOOTING LAYOUT PLAN AND DETAILS				
APPROVED BY:				
MIN. RASHED	DATE	N.T.S.	REV.	DATE
ST	JUNE 1, 2018		6073	SBBU-MPH-ST-01



PLINTH BEAM LAYOUT PLAN

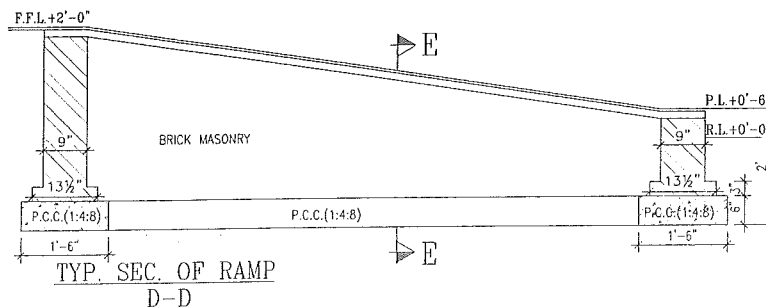


SECTION C-C



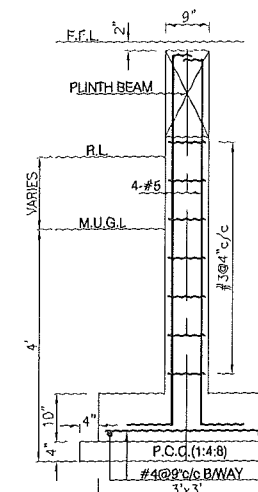
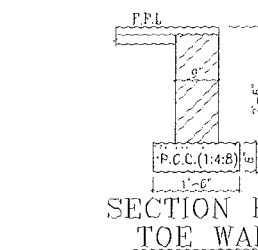
TYPICAL SECTION PLINTH BEAM

SEC. A-A WINDOW JAMBS TYPICAL

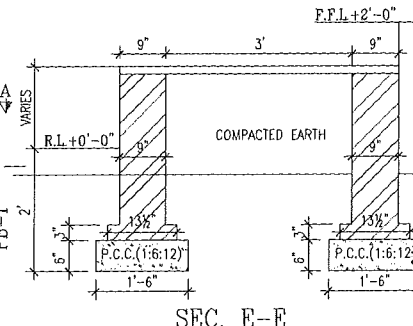


TYP. SEC. OF RAMP D-D

SECTION B-B TOE WALL

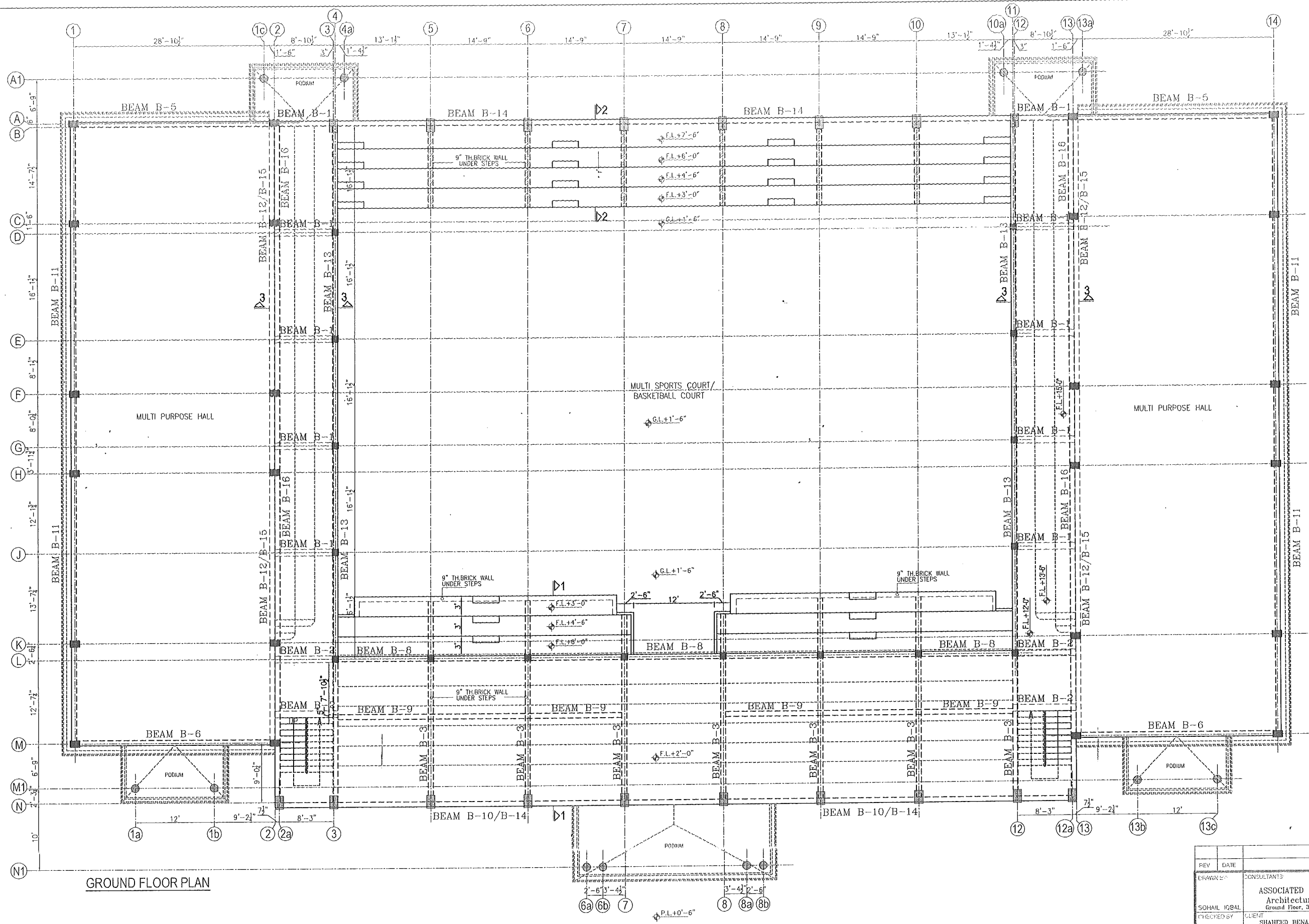


TYP. SEC. OF DUMMY COLUMN FOOTING



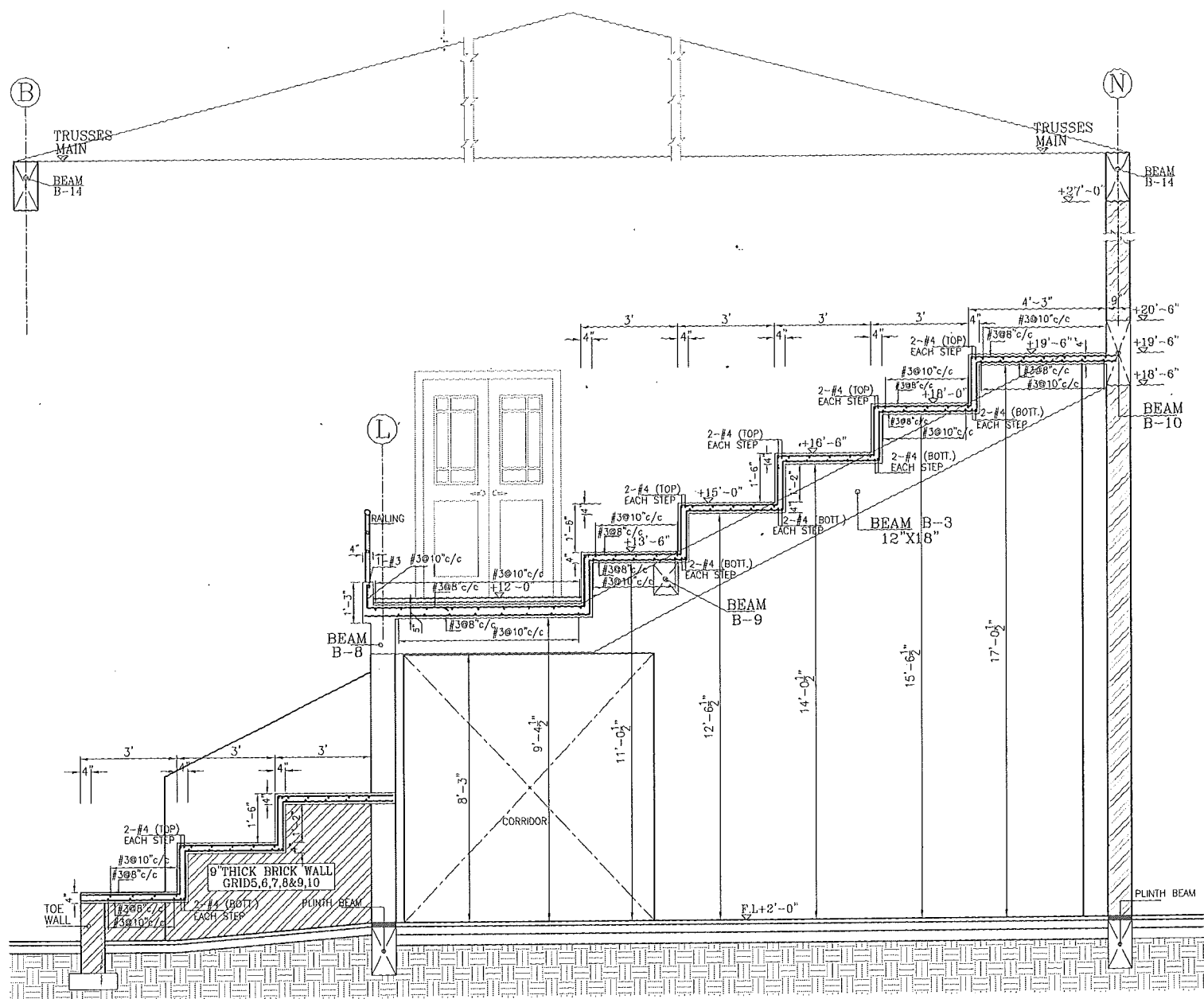
SEC. E-E

REV	DATE	DESCRIPTION		DRN
DRAWN BY	CONSULTANTS:-			
SOHAIL IQBAL	ASSOCIATED CONSULTING ENGINEERS ACF (PVT) LTD. Architectural & Town Planning Services,Section Ground Floor, 99 Civic Centre, M-Block, Model Town Extension, Lahore			
CHECKED BY	CLIENT	SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERKINGAL DIR UPPER		
MAN RASHEED	PROJECT	MASTER PLANNING ARCHITECTURAL, ENGINEERING DESIGN & CONSTRUCTION SUPERVISION OF SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERKINGAL DIR UPPER		
ENGINEER	DESCRIPTION:-			
MAN RASHEED	MULTIPURPOSE HALL PLINTH BEAM LAYOUT PLAN & DETAILS			
APPROVED BY	TITLE	SCALE	JOINT NO	JOINT NO
	ST	N.T.S	6073	
J.H. ALVI	DATE	JUNE : 2018		SBBU-MPH-ST-0

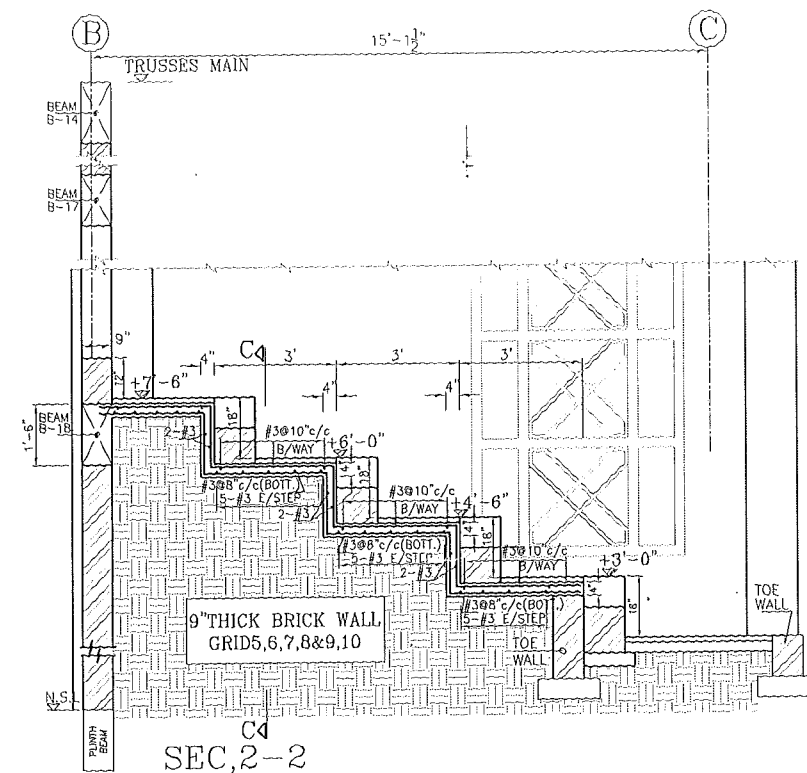


GROUND FLOOR PLAN

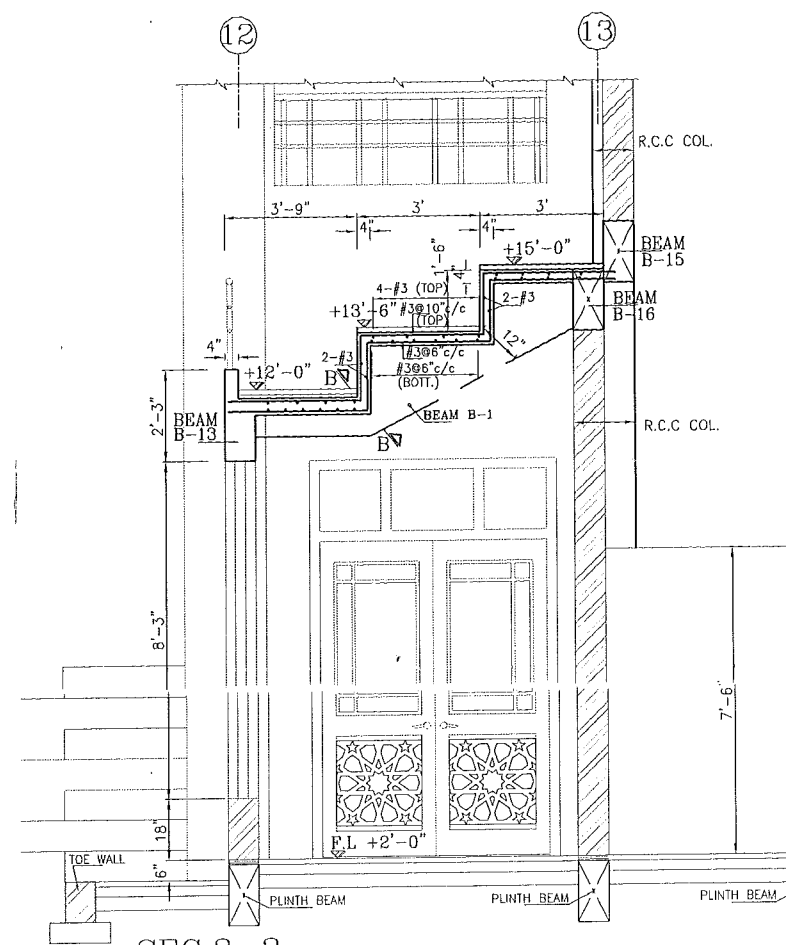
REV	DATE	DESCRIPTION	DRN	CHKD
DRAWN BY	CONSULTANT	ASSOCIATED CONSULTING ENGINEERS-ACE (PVT) LTD. Architectural & Town Planning Services, Section Ground Floor, 38 Civic Center, N-Block, Model Town Extension, Lahore		
CHECKED BY	CLIENT	SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER		
ENGINEER	DESIGNER	MASTER PLANNING ARCHITECTURAL, ENGINEERING DESIGN & CONSTRUCTION SUPERVISION OF SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER		
APPROVED BY	DESCRIPTION	MULTIPURPOSE HALL GROUND FLOOR ROOF BEAM FRAMING PLAN		
DATE	TIME	HTS.	NO.	REV.
ST	10:10		6073	BBU-MPH-ST-03



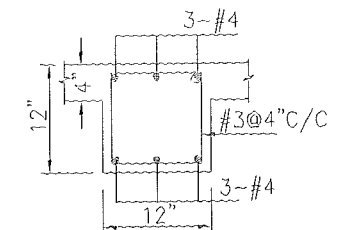
SEC, 1-1



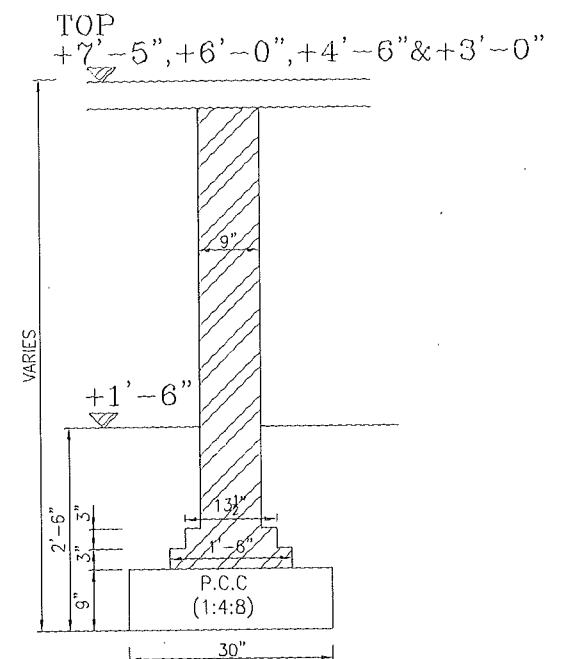
SEC, 2-2



SEC, 3-3

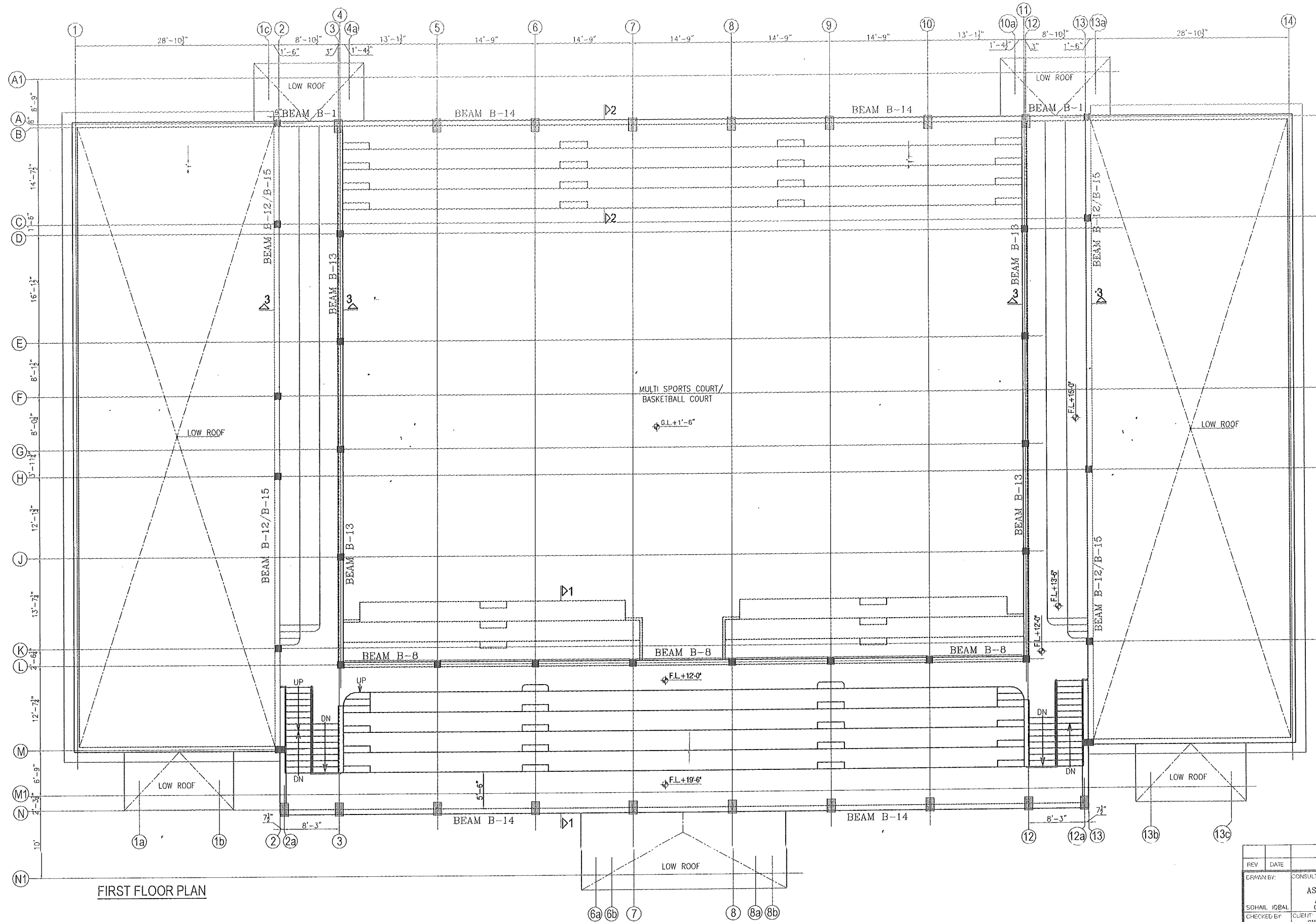


SEC, B-B
(B-1)

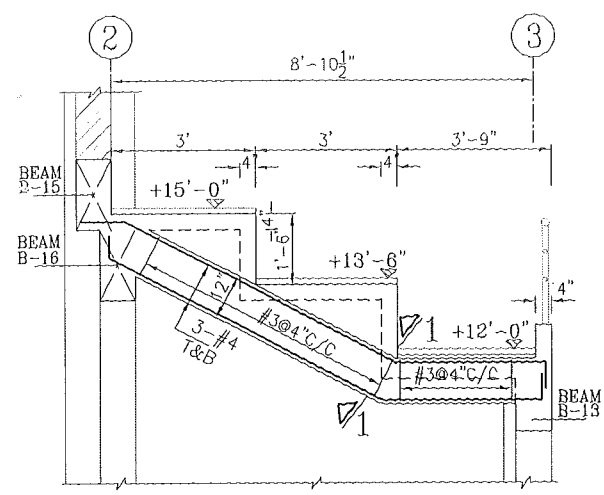


SEC, C-C
WALL UNDER SEATING AREA
GRID 5,6,7,8,9&10

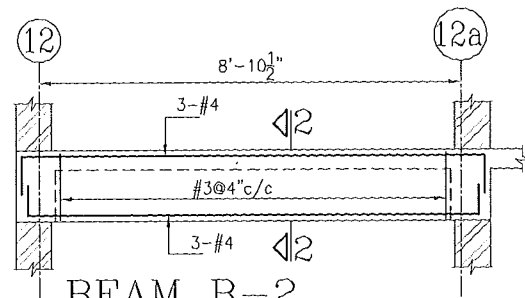
REV	DATE	DESCRIPTION	DWN	CHKD.
DRAWN BY	CONSULTANTS	ASSOCIATED CONSULTING ENGINEERS-ACE (PVT) LTD. Architectural & Town Planning Services, Section Ground Floor, 36 Civic Center, M-Block, Model Town Extension, Lahore		
SOHAIB IQBAL	CLIENT	SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER		
CHECKED BY	PROJECT	MASTER PLANNING ARCHITECTURAL ENGINEERING DESIGN & CONSTRUCTION SUPERVISION OF SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER		
MAN RASHEED	ENGINEER	MULTIPURPOSE HALL SECTION SHOWN REINFORCEMENT		
APPROVED BY	THE	SCALE	DATE	6073
KHALID NAWAZ	ST	N.T.S.	MAR : 2018	SBBU-MPH-ST-04



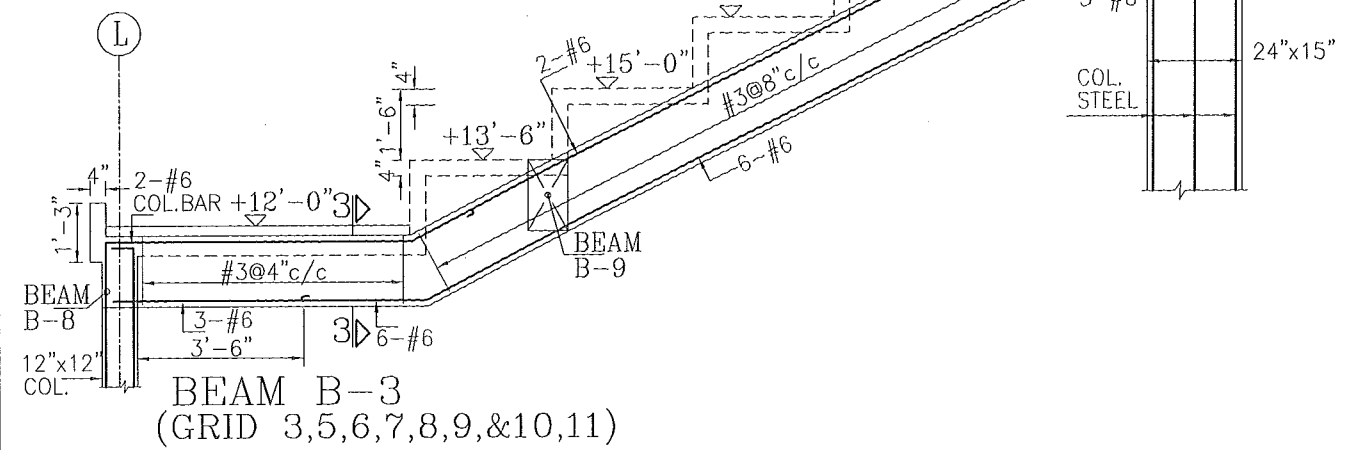
REV	DATE	DESCRIPTION	DRN	CHKD.
CONSULTANTS:				
ASSOCIATED CONSULTING ENGINEERS-ACE (PVT) LTD.				
Architectural & Town Planning Services, Section				
Ground Floor, 38 Civic Center, M-Block, Model Town Extension, Lahore				
CLIENT:				
SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER				
PROJECT:				
MASTER PLANNING ARCHITECTURAL, ENGINEERING				
DESIGN & CONSTRUCTION SUPERVISION OF				
SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER				
ENGINEER:				
DESCRIPTION:				
MULTIPURPOSE HALL				
FIRST FLOOR ROOF BEAM				
FRAMING PLAN				
APPROVED BY:				
MIAN RASHEED				
DATE:				
MAR : 2018				
N.T.S.				
6073				
SBBU-MPH-ST-08				



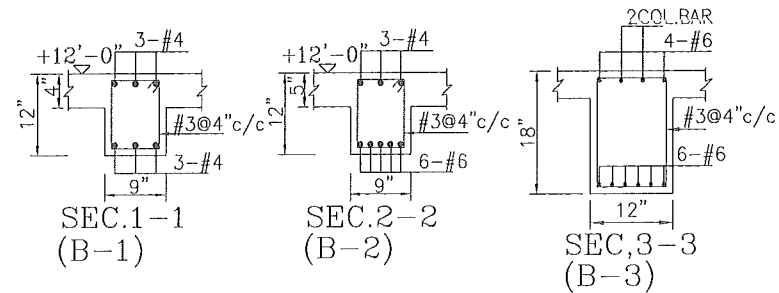
BEAM B-1



BEAM B-2



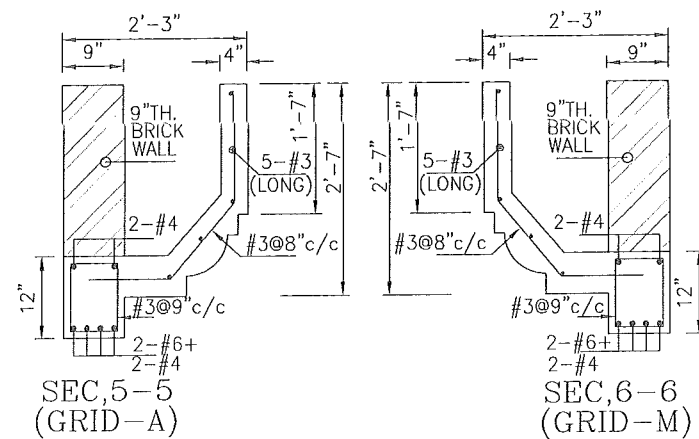
BEAM B-3
(GRID 3,5,6,7,8,9,&10,11)



SEC.1-1
(B-1)

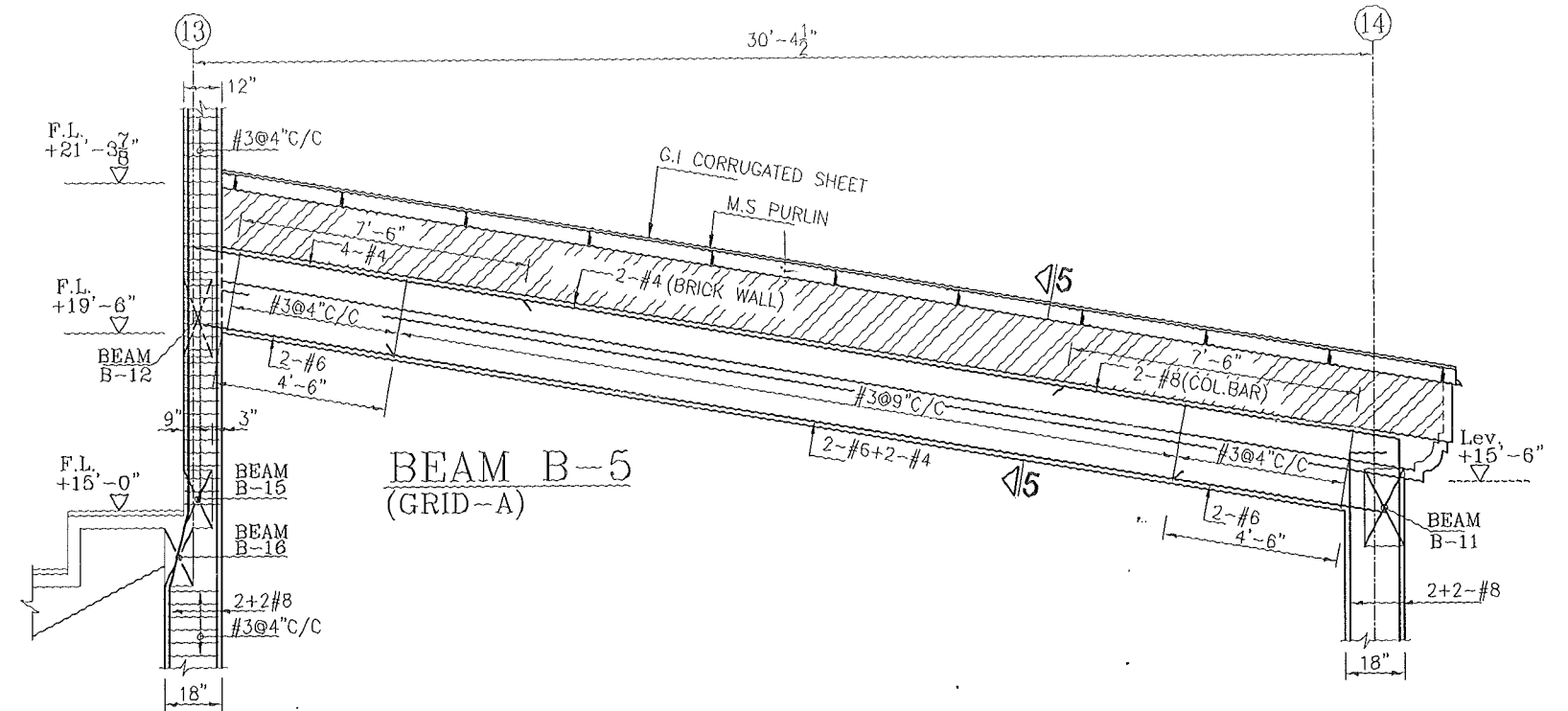
SEC.2-2
(B-2)

SEC.3-3
(B-3)

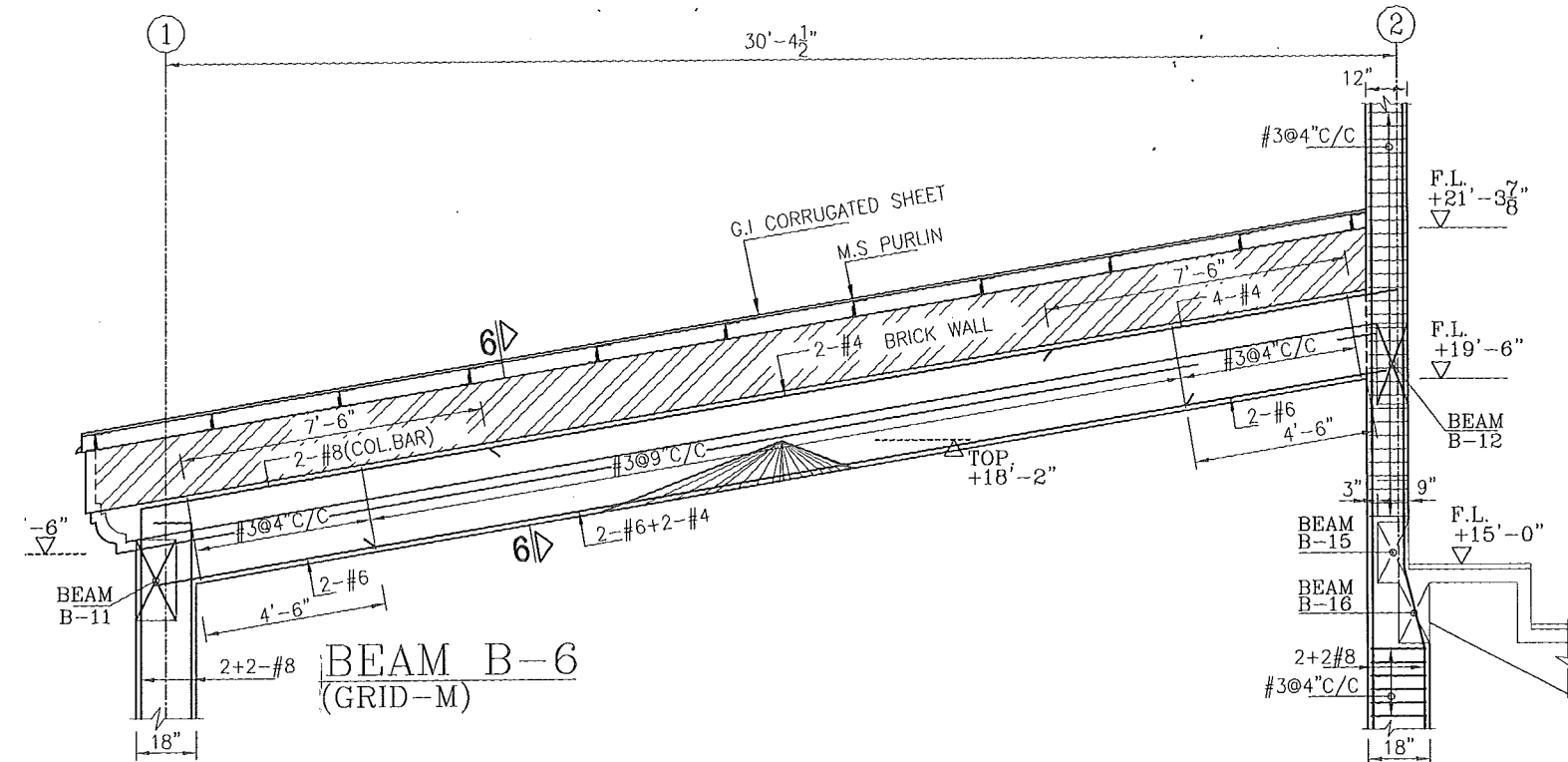


SEC.5-5
(GRID-A)

SEC.6-6
(GRID-M)

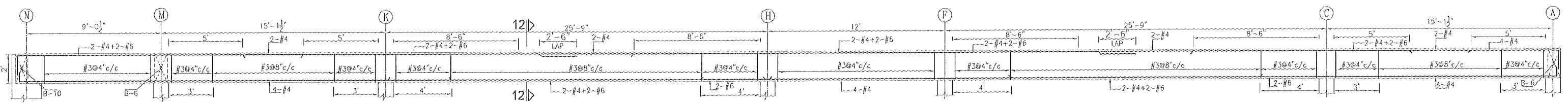


BEAM B-5
(GRID-A)

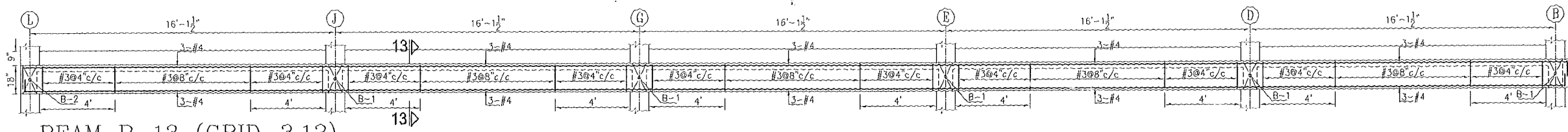


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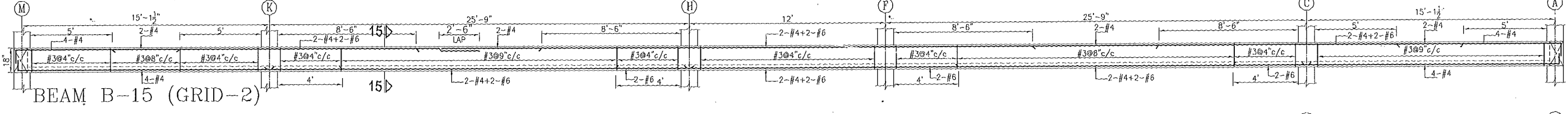
REV	DATE	DESCRIPTION	DRN	CHKD.
DRAWN BY:	CONSULTANTS:	ASSOCIATED CONSULTING ENGINEERS-ACE (PVT) LTD. Architectural & Town Planning Services, Section Ground Floor, 38 Chic Center, W-Block, Model Town Extension, Lahore		
CHECKED BY:	CLIENT:	SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER		
ENGINEER:	PROJECT:	MASTER PLANNING ARCHITECTURAL, ENGINEERING DESIGN & CONSTRUCTION SUPERVISION OF SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER		
APPROVED BY:	DESCRIPTION:	REINF.DETAIL OF GROUND FLOOR ROOF BEAM & SECTIONS		
TYPE	SCALE	N.T.S.	JOB NO	DRG NO.
ST	DATE	MAR : 2018	6073	SBEU-MPH-ST-07



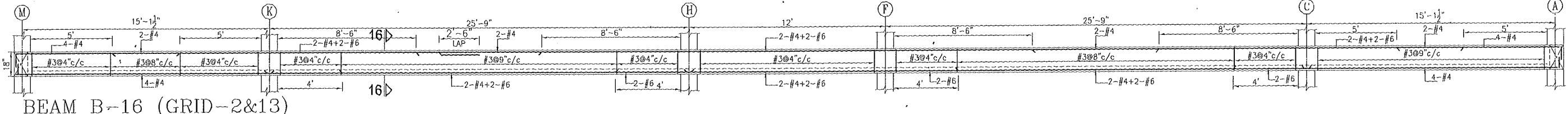
BEAM B-12 (GRID-2,13)



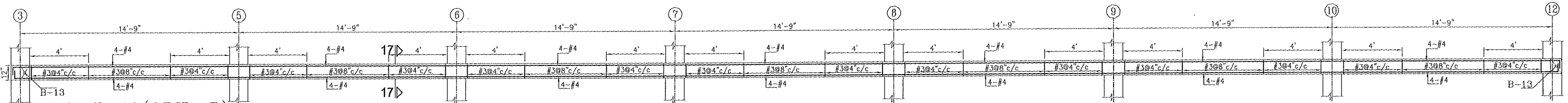
BEAM B-13 (GRID-3,12)



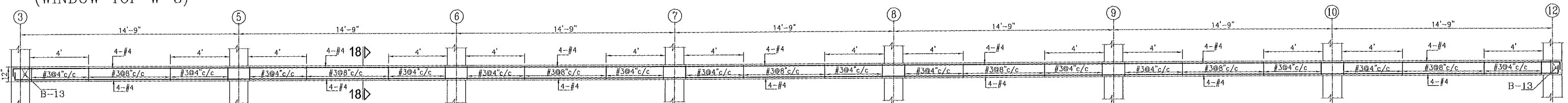
BEAM B-15 (GRID-2)



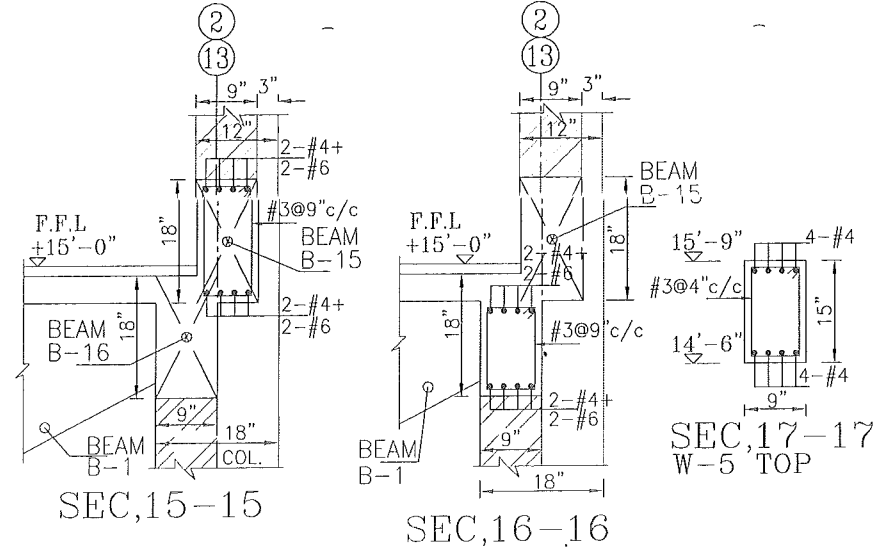
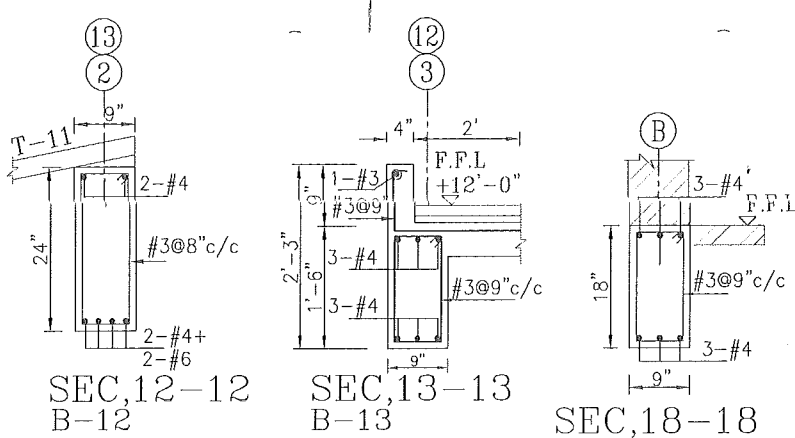
BEAM B-16 (GRID-2&13)



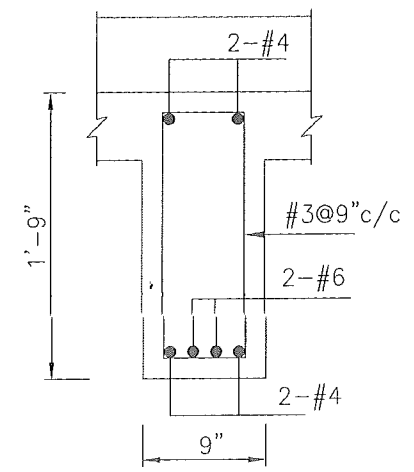
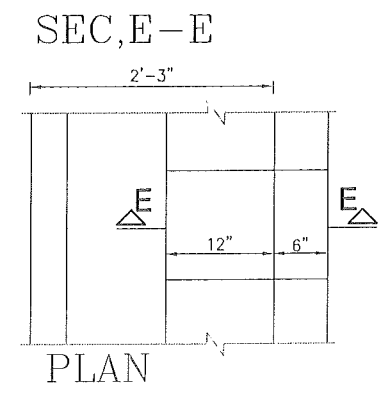
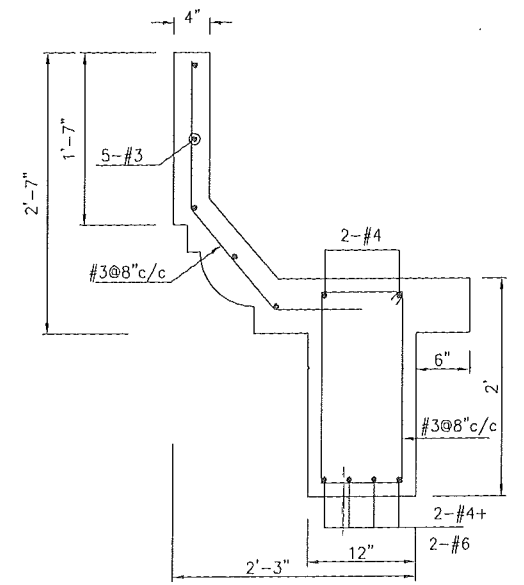
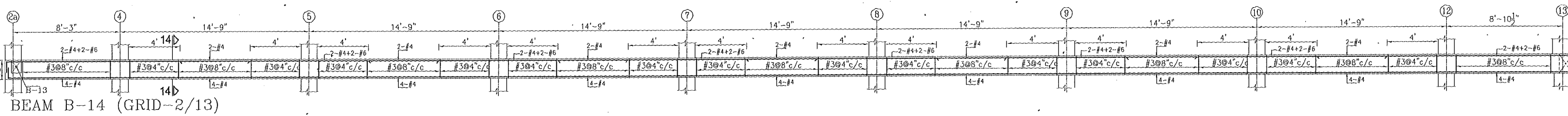
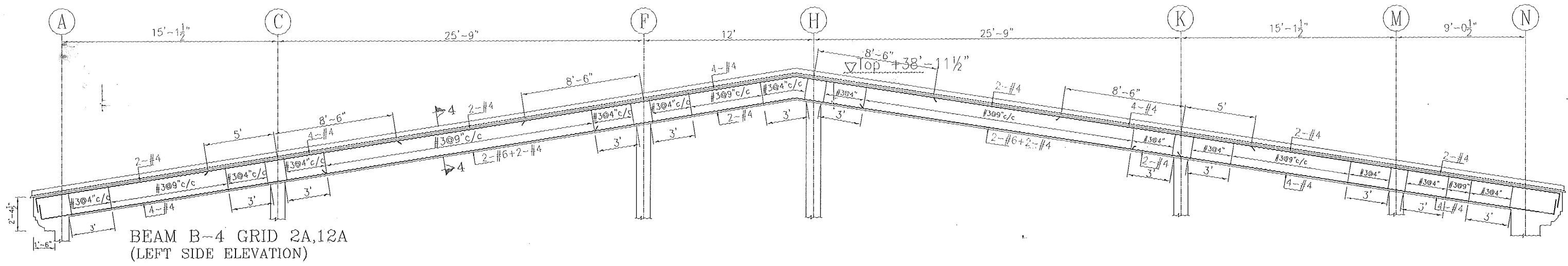
BEAM B-17 (GRID-B)
(WINDOW TOP W-5)



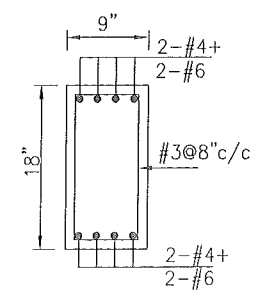
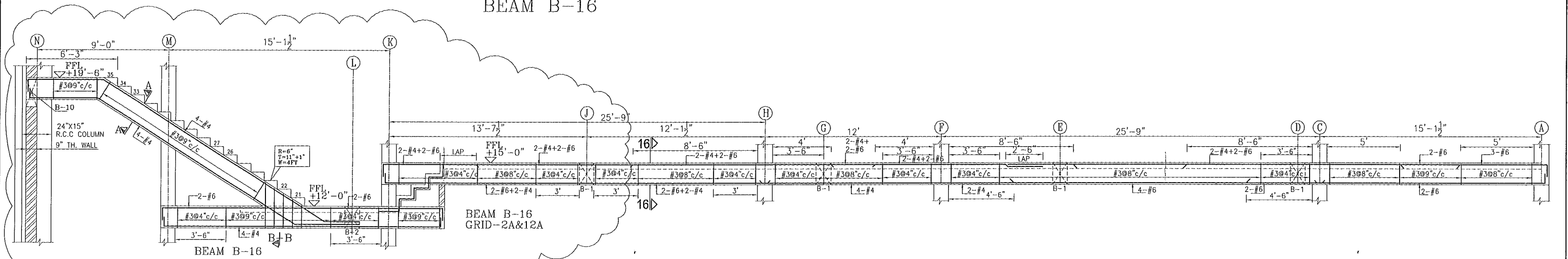
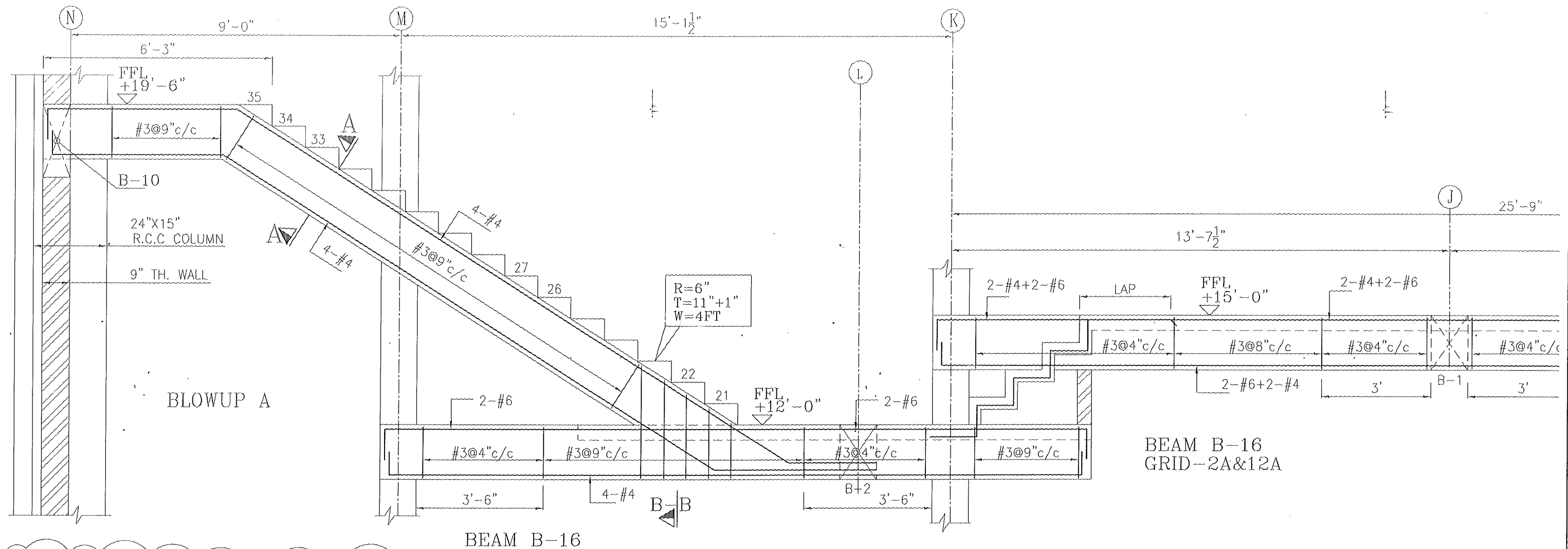
BEAM B-18 (GRID-'B')



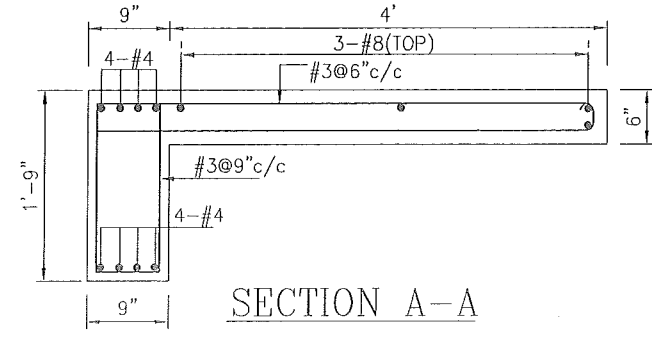
REV	DATE	DESCRIPTION	DRN	CHKD
CONSULTANTS				
ASSOCIATED CONSULTING ENGINEERS-ACE (PVT) LTD.				
Architectural & Town Planning Services, Section				
Ground Floor, 36 Civic Center, M-Block, Model Town Extension, Lahore				
CLIENT				
SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER				
PROJECT				
MASTER PLANNING ARCHITECTURAL ENGINEERING				
DESIGN & CONSTRUCTION SUPERVISION OF				
SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER				
DESCRIPTION				
REINF.DETAIL OF GROUND FLOOR				
ROOF BEAM & SECTIONS				
APPROVED BY				
TYPE		SCALE	NO.150	DRGNO
ST		DATE	N.T.S.	
KHALID HAWAZ		MAR : 2016	6073	SBBU-MPII-ST-08



REV.	DATE	DESCRIPTION	DRN	CHKD
DRAWN BY:		CONSULTANTS		
SOHAIL IQBAL		ASSOCIATED CONSULTING ENGINEERS-ACE (PVT) LTD. Architectural & Town Planning Services, Section Ground Floor, 38 Civic Center, N-Block, Model Town Extension, Lahore		
CHECKED BY:		CLIENT: SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER		
MAN. RASHEED		PROJECT: MASTER PLANNING ARCHITECTURAL ENGINEERING DESIGN & CONSTRUCTION SUPERVISION OF SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER		
ENGINEER		DESCRIPTION: REINF. DETAIL OF GROUND FLOOR ROOF BEAM B-4, B-14 & SECTIONS		
MAN. RASHEED				
APPROVED BY:	TYPE	SCALE	NO. OF SETS	DATE
ST		N.T.S.	6073	ST
Y. HALID HAWAZ		MAR : 2018		EBBU-MPH-ST-10

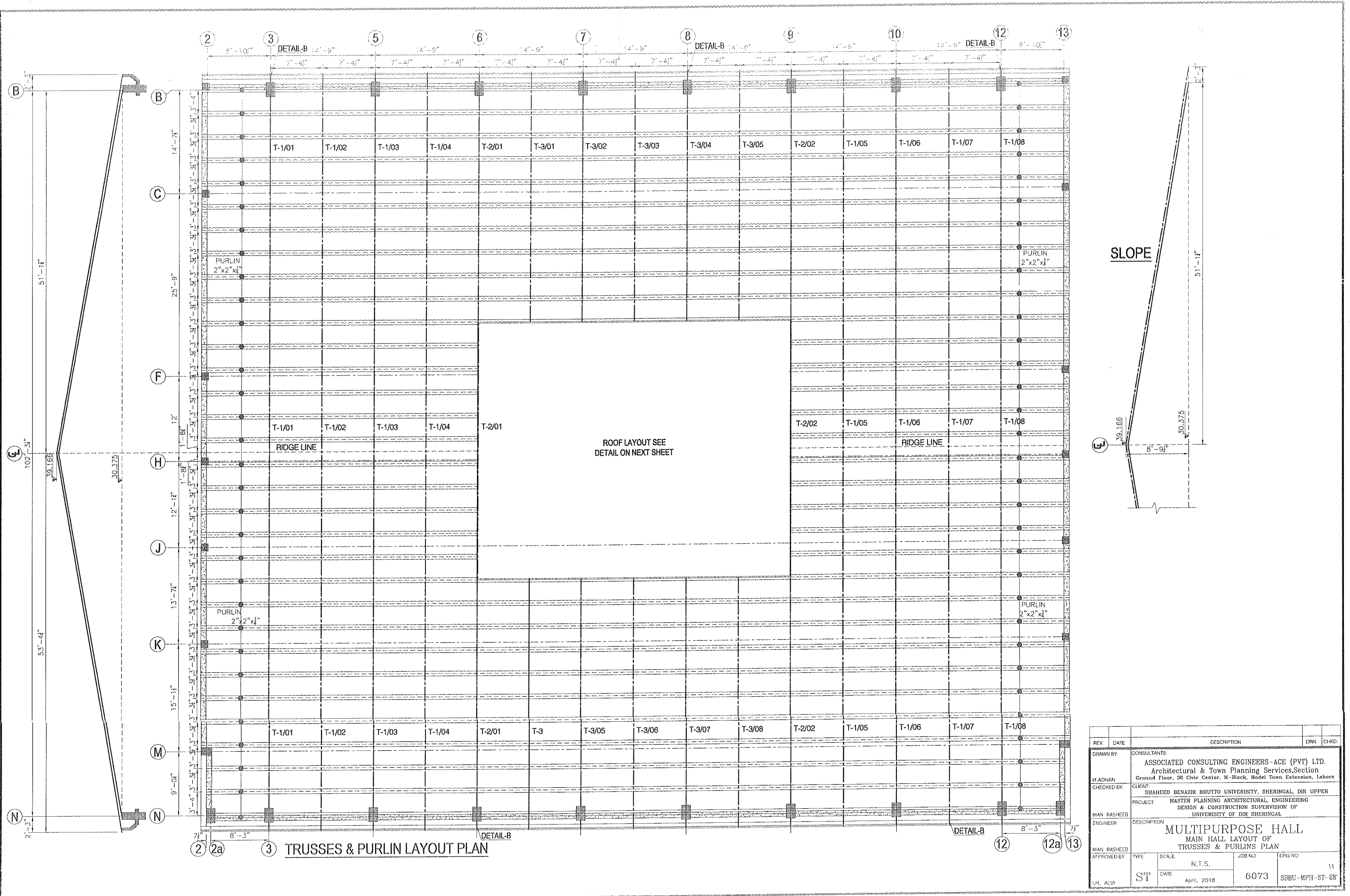


SEC,16-16



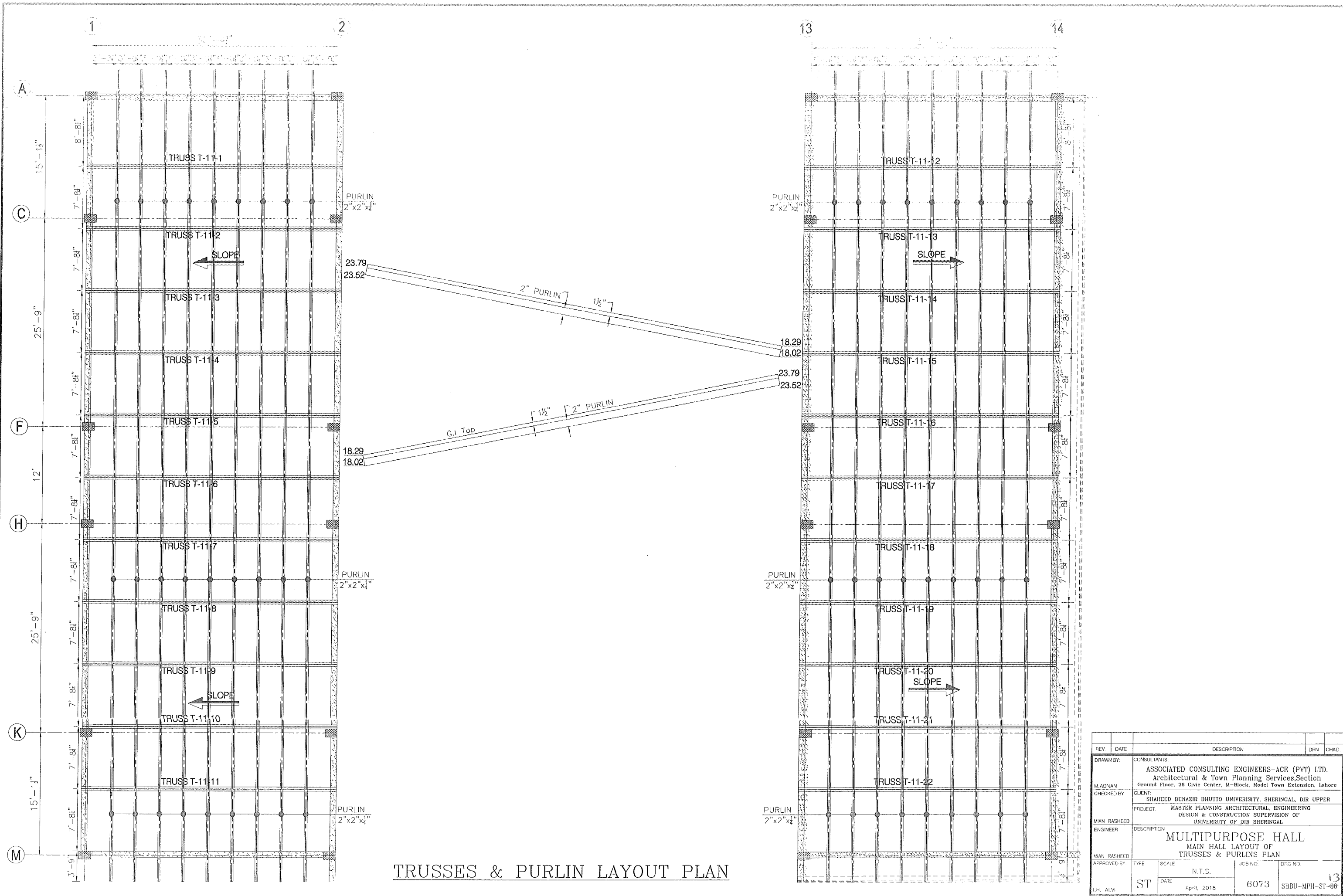
SECTION A-A

REV	DATE	DESCRIPTION	DRN	CHKD
CONSULTANTS				
ASSOCIATED CONSULTING ENGINEERS-ACE (PVT) LTD.				
Architectural & Town Planning Services, Section				
Ground Floor, 36 Civic Center, M-Block, Model Town Extension, Lahore				
CLIENT				
SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER				
PROJECT				
MASTER PLANNING ARCHITECTURAL, ENGINEERING				
DESIGN & CONSTRUCTION SUPERVISION OF				
SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER				
DESCRIPTION				
REINF.DETAIL OF GROUND FLOOR				
ROOF BEAM B-16 & SECTIONS				
APPROVED BY				
TIME	SCALE	N.T.S.	DATE	MARK : 2018
ST			6073	SBBU-MPH-ST-11



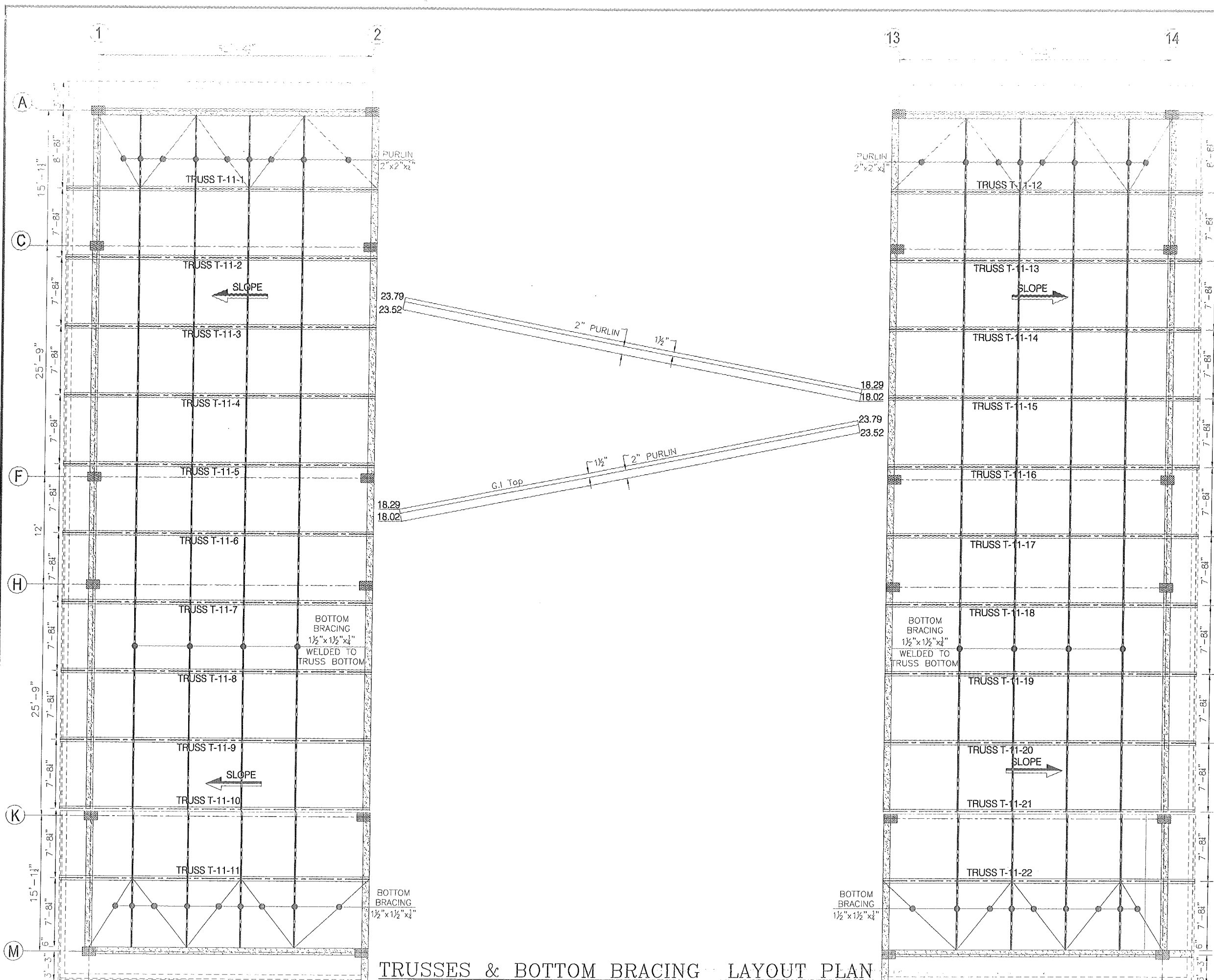
2a 3 TRUSSES & PURLIN LAYOUT PLAN

REV.	DATE	DESCRIPTION	DRN.	CHKD.
DRAWN BY:		CONSULTANTS:		
M.ADNAN		ASSOCIATED CONSULTING ENGINEERS-ACE (PVT) LTD.		
CHECKED BY:		Architectural & Town Planning Services, Section		
ENGINEER		Ground Floor, 36 Civic Center, M-Block, Model Town Extension, Lahore		
CLIENT:		SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER		
PROJECT:		MASTER PLANNING ARCHITECTURAL, ENGINEERING		
DESCRIPTION:		DESIGN & CONSTRUCTION SUPERVISION OF		
		UNIVERSITY OF DIR SHERINGAL		
		MULTIPURPOSE HALL		
		MAIN HALL LAYOUT OF		
		TRUSSES & PURLINS PLAN		
APPROVED BY:	TYPE	SCALE	JOB NO	DRG NO
L.H. ALVI	ST	N.T.S.	6073	SBBU-MPH-ST-28
	DATE	April, 2018		

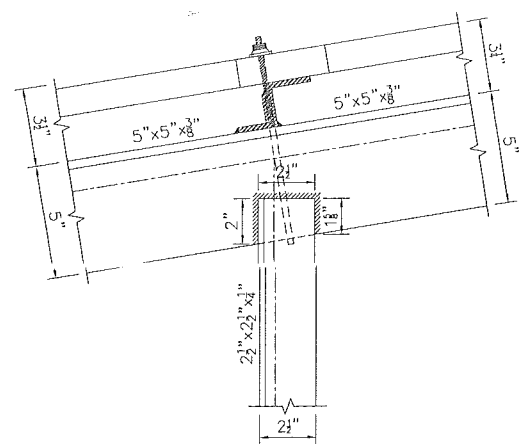


TRUSSES & PURLIN LAYOUT PLAN

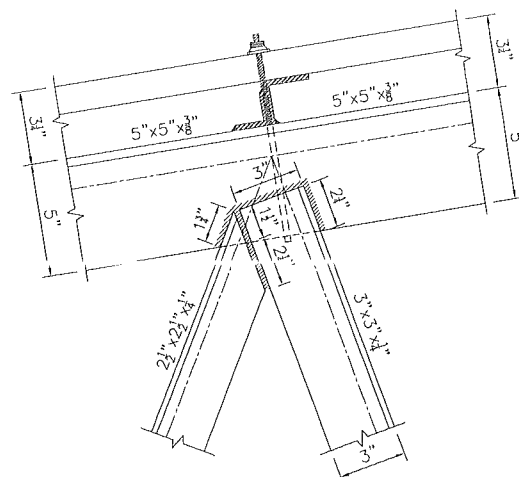
REV	DATE	DESCRIPTION	DRN	CHKD.
DRAWN BY:	CONSULTANTS			
CHECKED BY:	ASSOCIATED CONSULTING ENGINEERS-ACE (PVT) LTD. Architectural & Town Planning Services, Section Ground Floor, 38 Civic Center, M-Block, Model Town Extension, Lahore			
ENGINEER:	CLIENT: SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER PROJECT: MASTER PLANNING ARCHITECTURAL, ENGINEERING DESIGN & CONSTRUCTION SUPERVISION OF UNIVERSITY OF DIR SHERINGAL			
DESCRIPTION:	MULTIPURPOSE HALL MAIN HALL LAYOUT OF TRUSSES & PURLINS PLAN			
APPROVED BY:	TYPE	SCALE	JOB NO.	DWG NO.
L.H. ALVI	ST	N.T.S.	6073	13
	DATE	April, 2018		SBBU-MPH-ST-00



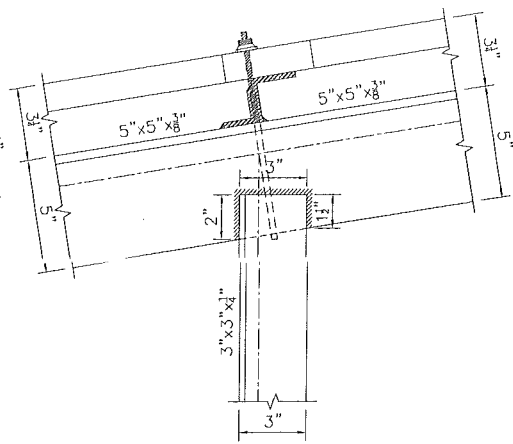
REV	DATE	DESCRIPTION	DRN	CHKD
DRAWN BY:		CONSULTANTS:		
CHECKED BY:		ASSOCIATED CONSULTING ENGINEERS-ACE (PVT) LTD.		
ENGINEER		Architectural & Town Planning Services, Section		
		Ground Floor, 38 Civic Center, M-Block, Model Town Extension, Lahore		
		CLIENT:		
		SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER		
		PROJECT:		
		MASTER PLANNING ARCHITECTURAL, ENGINEERING		
		DESIGN & CONSTRUCTION SUPERVISION OF		
		UNIVERSITY OF DIR SHERINGAL		
		DESCRIPTION:		
		MULTIPURPOSE HALL		
		MAIN HALL LAYOUT OF		
		TRUSSES & BOTTOM BRACING LAYOUT PLAN		
APPROVED BY:	TYPE	SCALE	JOB NO	DRG NO
I.H. ALVI	ST	N.T.S.	6073	SPBU-MPH-ST-34
	DATE	April, 2018		



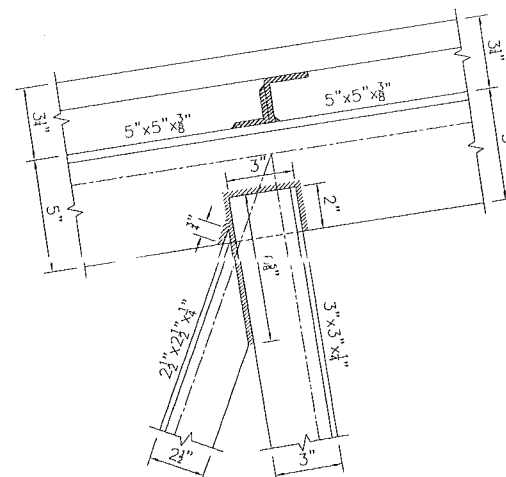
DETAIL-30&38



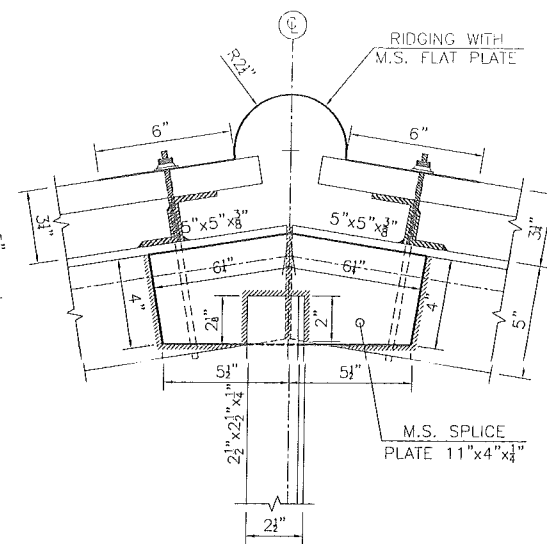
DETAIL-31&37



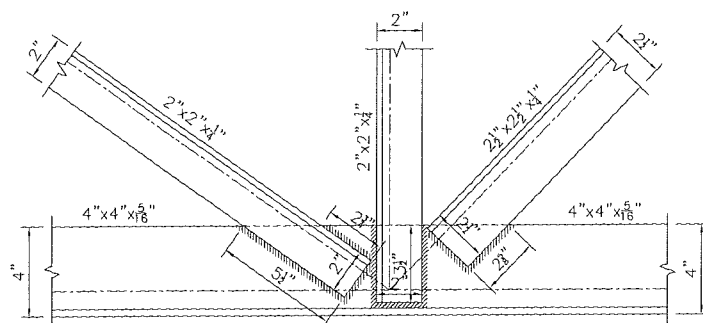
DETAIL-32&36



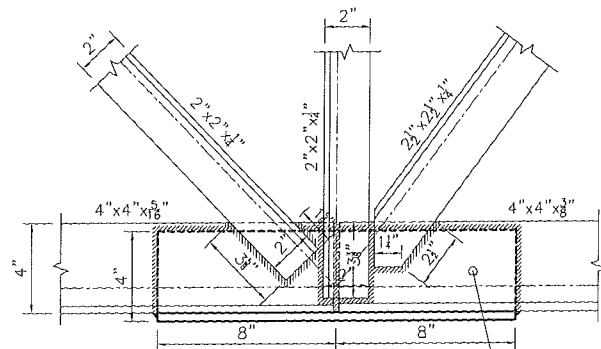
DETAIL-33&35



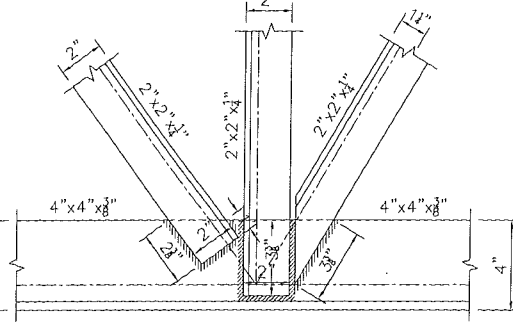
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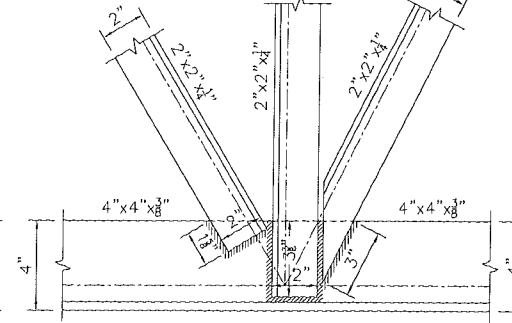
DETAIL-02 & 16



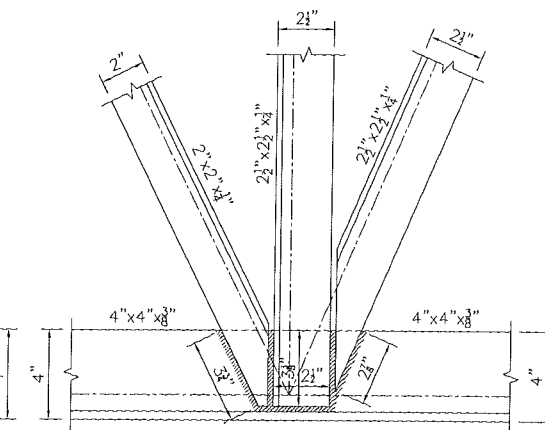
DETAIL-03 & 15



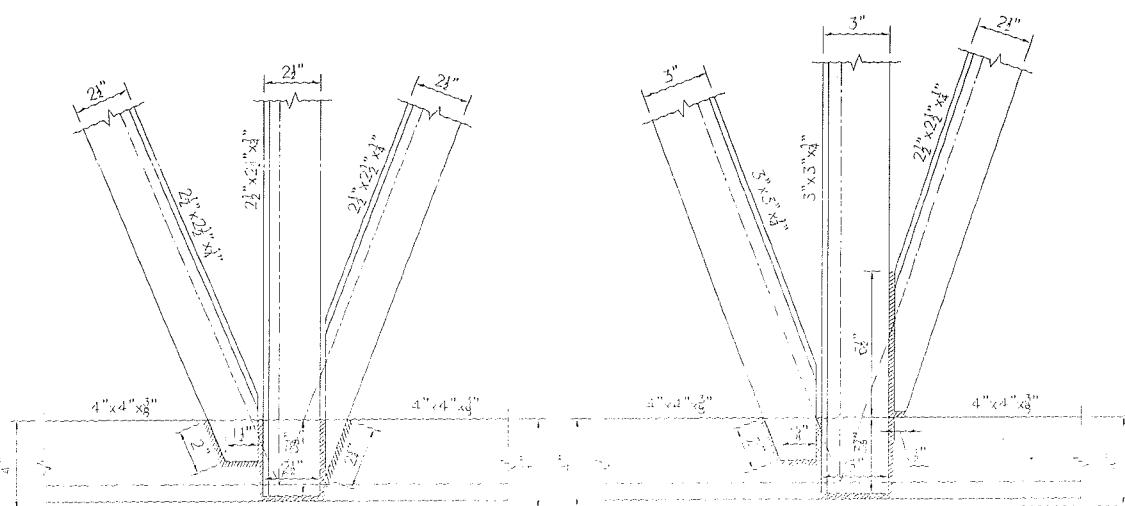
DETAIL-04 & 14



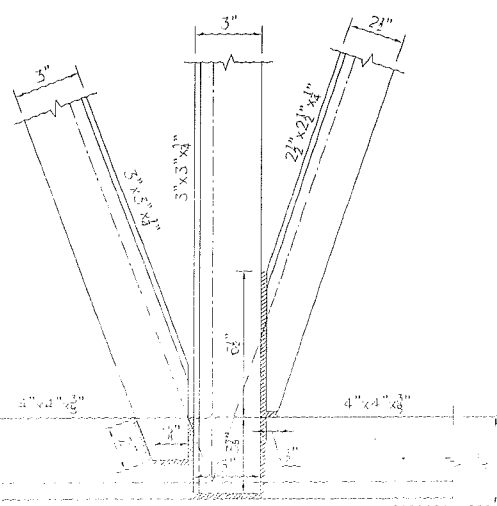
DETAIL-05 & 13



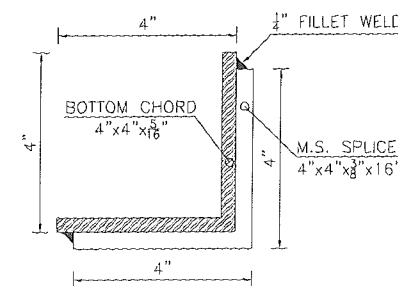
DETAIL-06 & 12



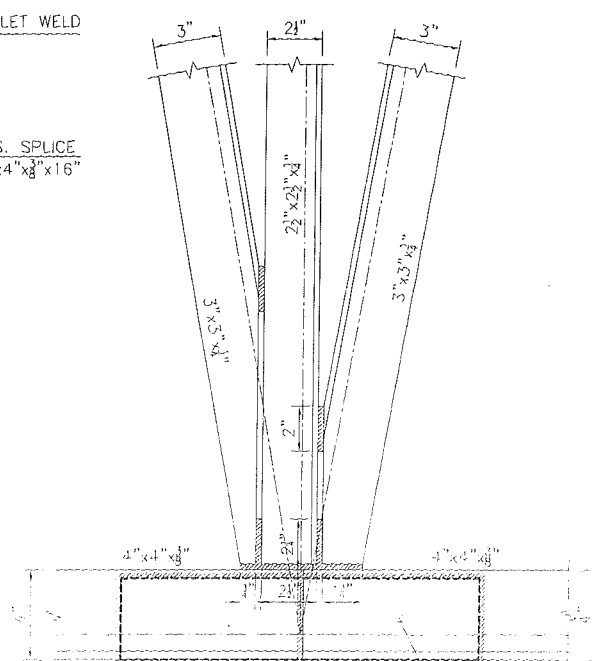
DETAIL-07 & 11



DETAIL-08 & 10

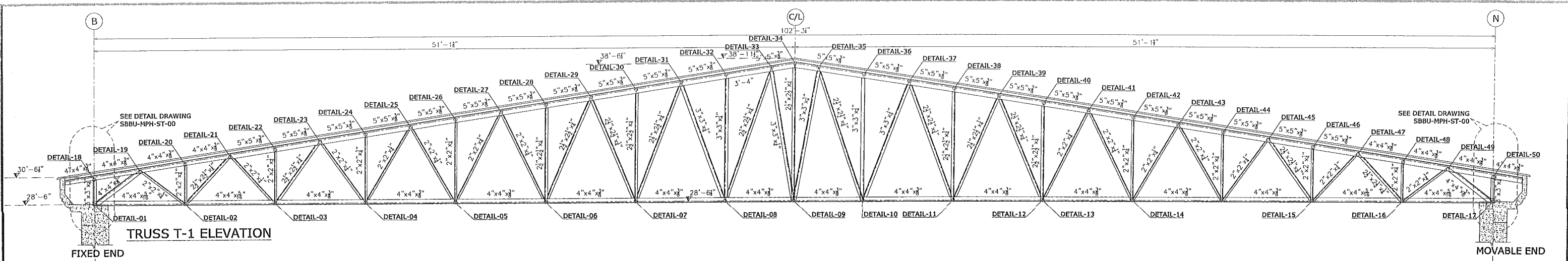


DETAIL-03 & 15
SECTION

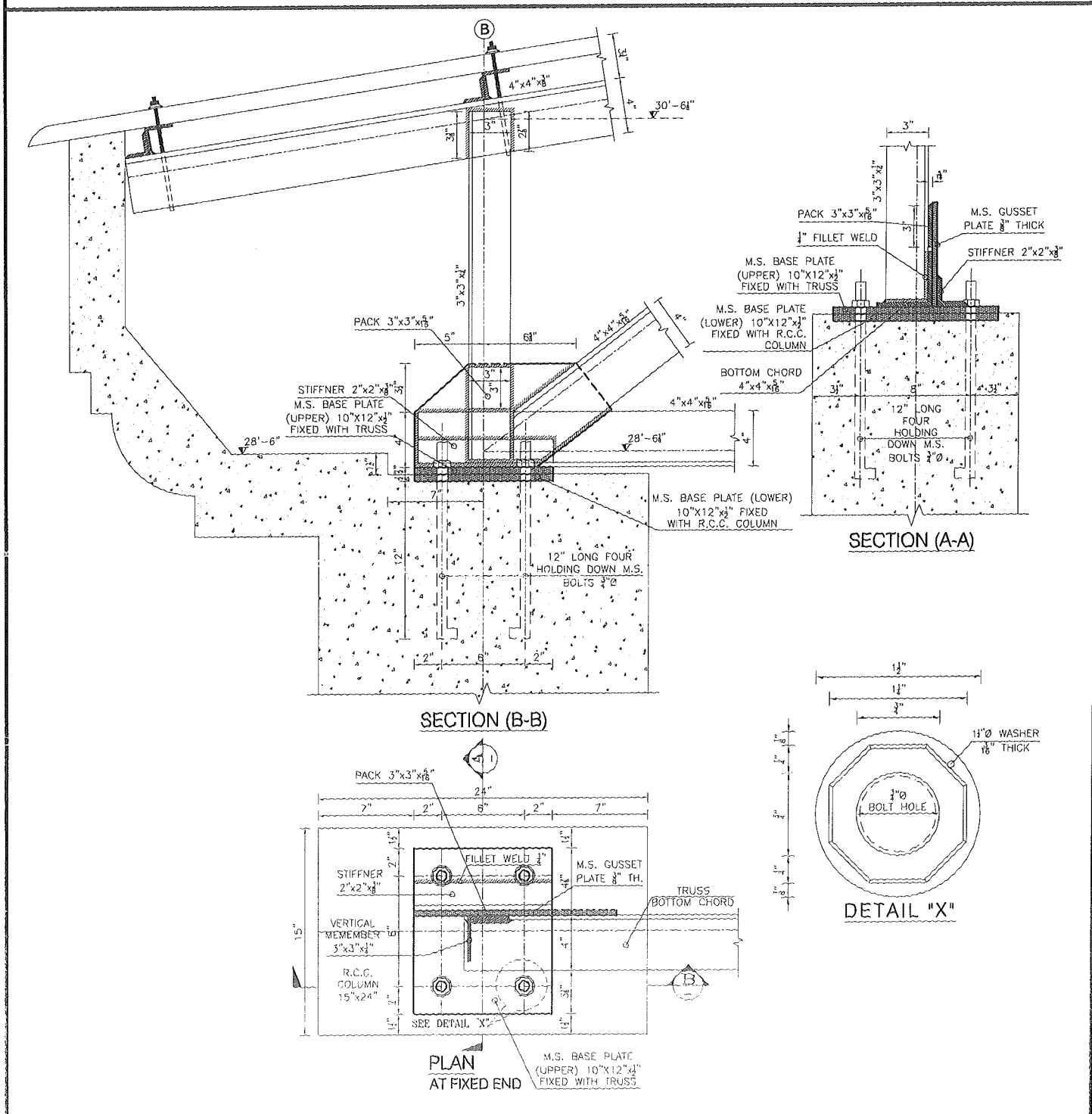


DETAIL-09

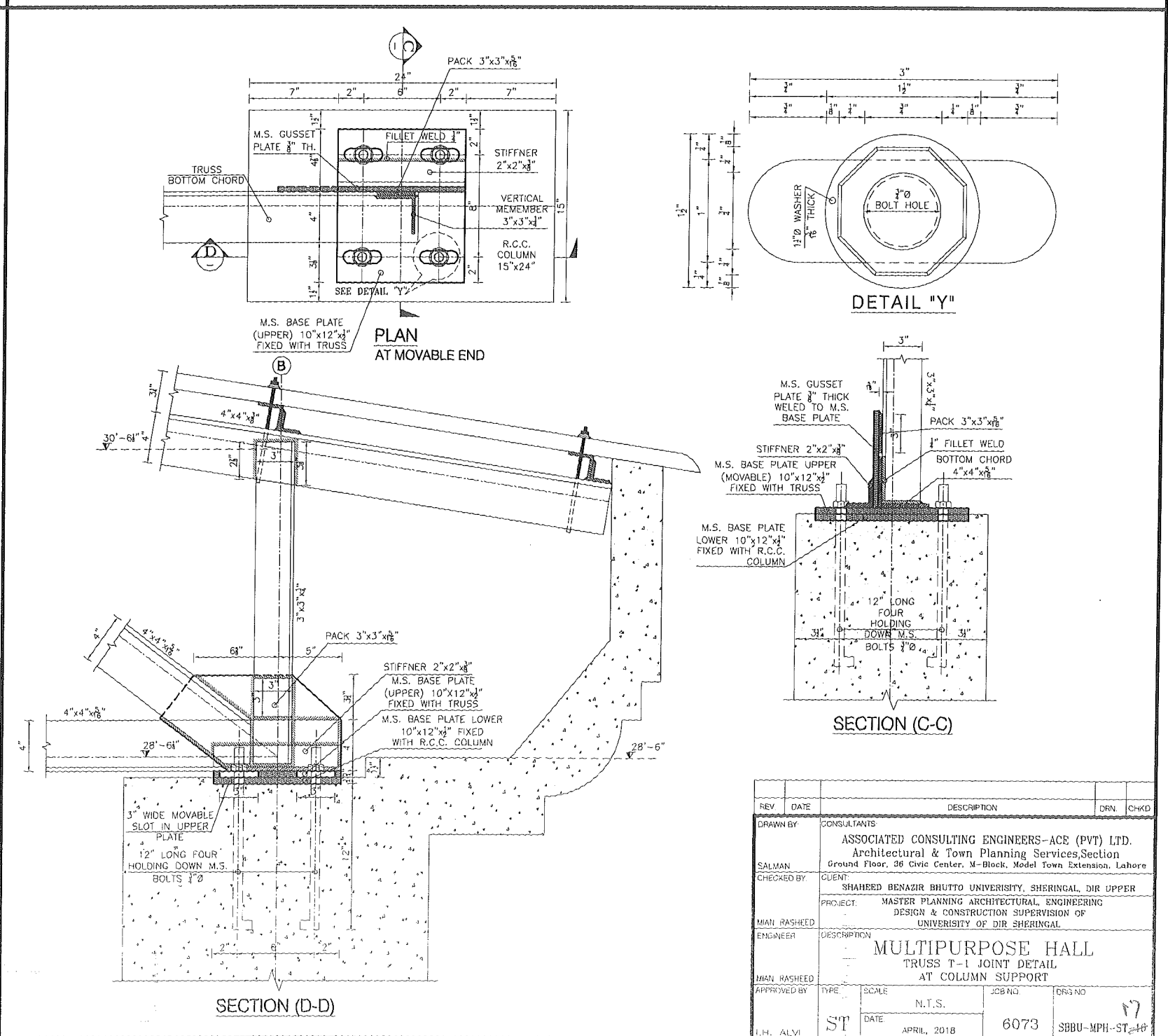
REV	DATE	DESCRIPTION	DRN	CHKD
DRAWN BY CONSULTANTS				
ASSOCIATED CONSULTING ENGINEERS-ACE (PVT) LTD.				
Architectural & Town Planning Services, Section				
Ground Floor, 38 Civic Center, M-Block, Model Town Extension, Lahore				
CHECKED BY CLIENT				
SHAHED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER				
PROJECT MASTER PLANNING ARCHITECTURAL, ENGINEERING				
DESIGN & CONSTRUCTION SUPERVISION OF				
UNIVERSITY OF DIR SHERINGAL				
MULTIPURPOSE HALL				
TRUSS T-01 JOINT DETAIL				
APPROVED BY				
ST				
DATE				
March, 2018				
6073				
SBBU-MPH-ST-18				



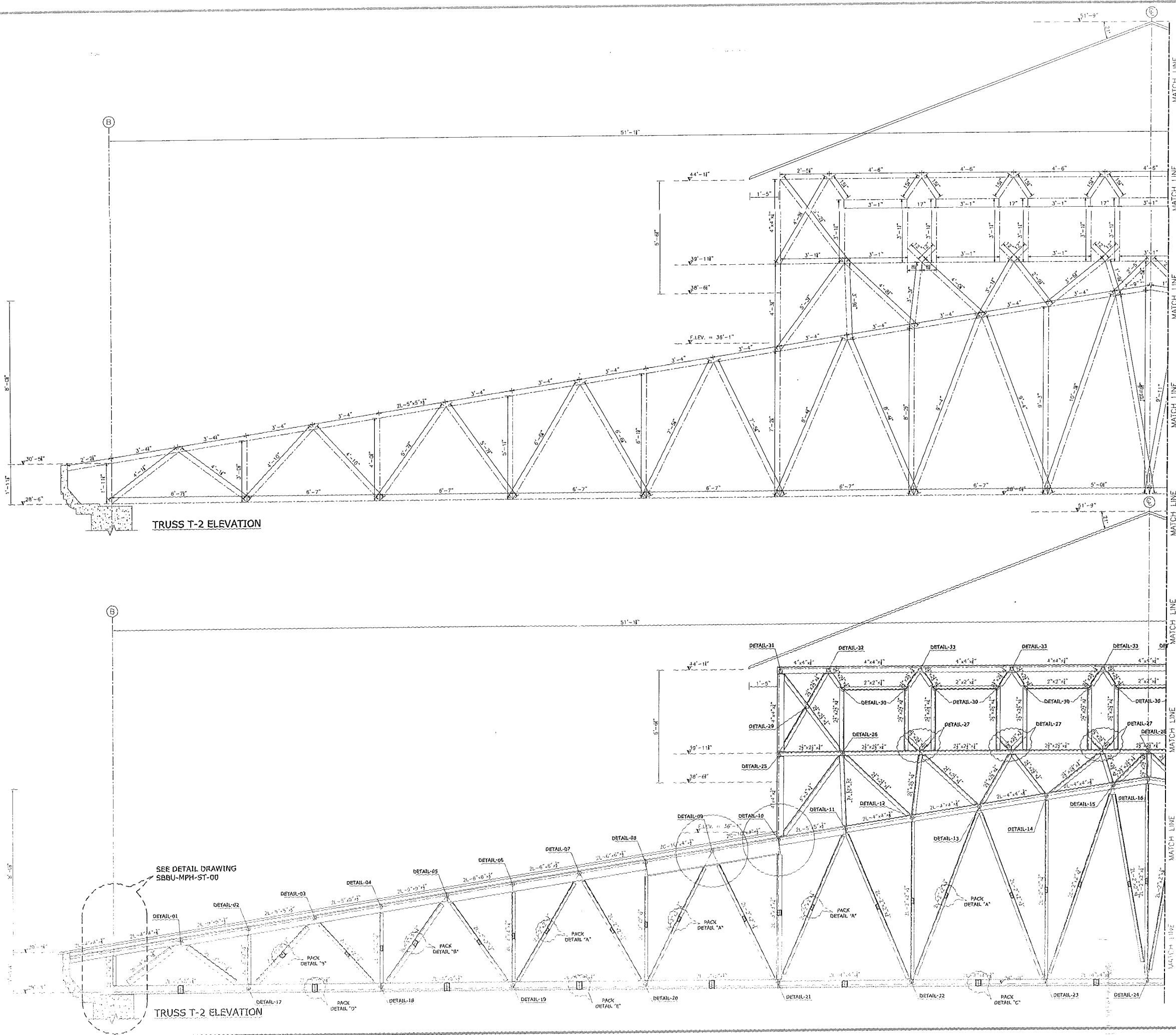
TRUSS FIXED END BEARING DETAIL AT GRID "B"



TRUSS FIXED END BEARING DETAIL AT GRID "N"

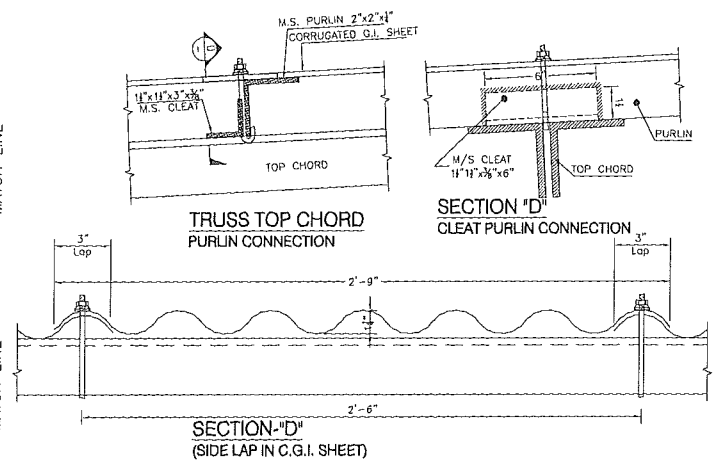
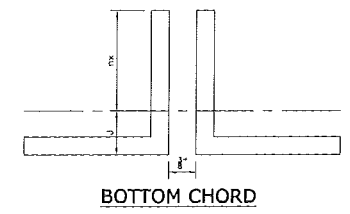
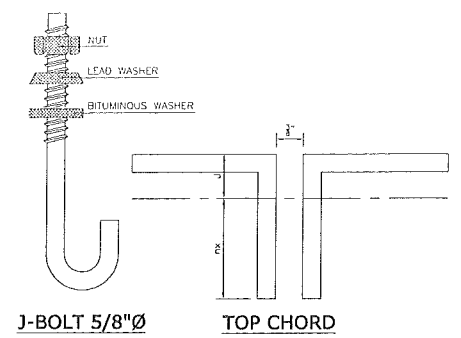


REV	DATE	DESCRIPTION	DRN	CHKD
DRAWN BY: CONSULTANTS				
ASSOCIATED CONSULTING ENGINEERS-ACE (PVT) LTD.				
Architectural & Town Planning Services, Section				
Ground Floor, 36 Civic Center, M-Block, Model Town Extension, Lahore				
CHECKED BY: CLIENT				
SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER				
PROJECT: MASTER PLANNING ARCHITECTURAL, ENGINEERING				
DESIGN & CONSTRUCTION SUPERVISION OF				
UNIVERSITY OF DIR SHERINGAL				
ENGINEER DESCRIPTION				
MULTIPURPOSE HALL				
TRUSS T-1 JOINT DETAIL				
AT COLUMN SUPPORT				
APPROVED BY: TYPE SCALE DATE				
N.T.S. APRIL, 2018				
JOB NO. 6073				
DRG NO. SBBU-MPH-ST-148				
I.H. ALVI				

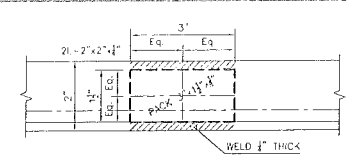
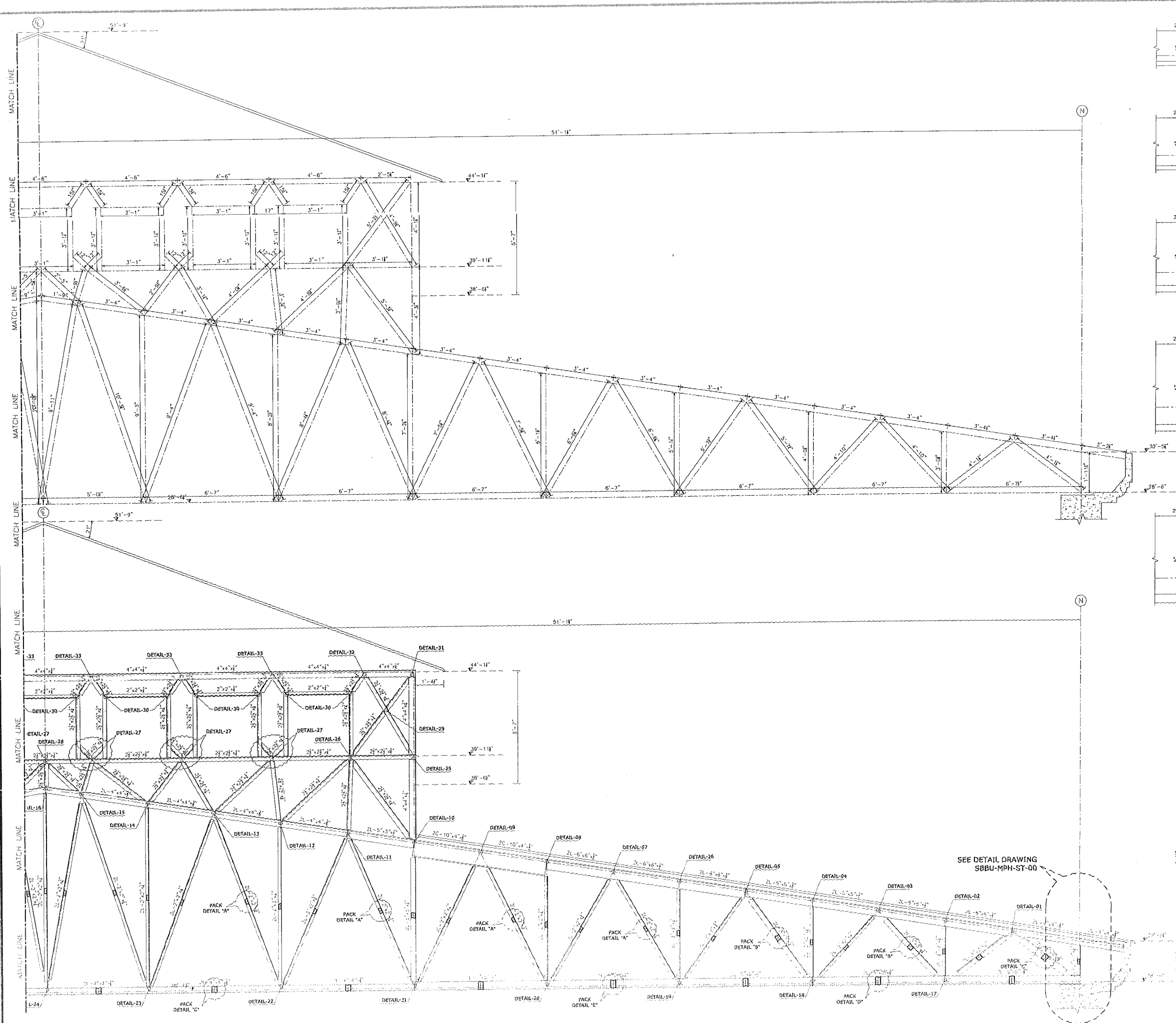


**ANGLE IRON
NEUTRAL AXIS**

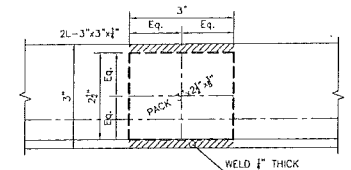
ANGLE SIZE	J
2"x2"x1/4"	0.58
2 1/2"x2 1/2"x1/4"	0.70
3"x3"x1/4"	0.83
4"x4"x1/4"	1.12
4"x4"x1/2"	1.09
5"x5"x1/4"	1.37
5"x5"x1/2"	1.42
6"x6"x1/2"	1.66
10"x4"x1/2"	2.00



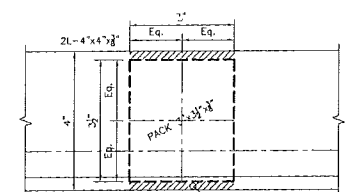
REV	DATE	DESCRIPTION	DRN	CHKD
DRAWN BY CONSULTANTS				
ASSOCIATED CONSULTING ENGINEERS-ACE (PVT) LTD.				
Architectural & Town Planning Services, Section				
Ground Floor, 36 Civic Center, M-Block, Model Town Extension, Lahore				
CHECKED BY CLIENT				
SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER				
PRIME-1 MASTER PLANNING ARCHITECTURAL ENGINEERING				
DESIGN & CONSTRUCTION SUPERVISION OF				
UNIVERSITY OF DIR SHERINGAL				
MAN RASHED ENGINEER				
MULTIPURPOSE HALL				
TRUSS T-02 ELEVATION				
APPROVED BY				
N.T.S.				
18				
ST. DATE May, 2013				
6073 SBBU-MPH-ST-00				



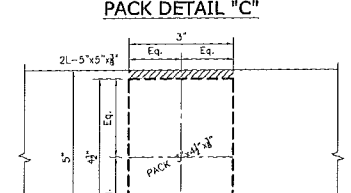
PACK DETAIL "A"



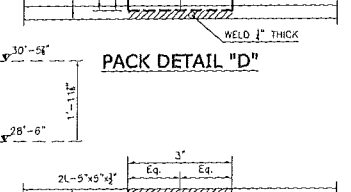
PACK DETAIL "B"



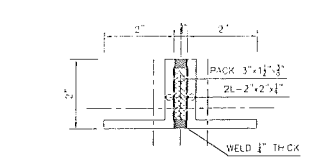
PACK DETAIL "C"



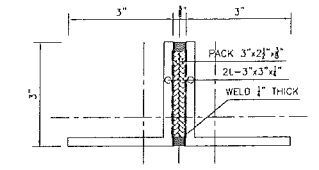
PACK DETAIL "D"



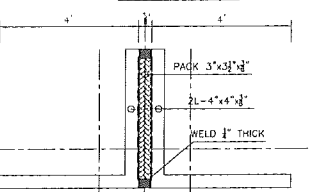
PACK DETAIL "E"



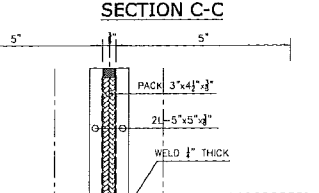
SECTION B-B



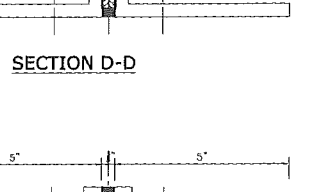
SECTION B-B



SECTION C-C



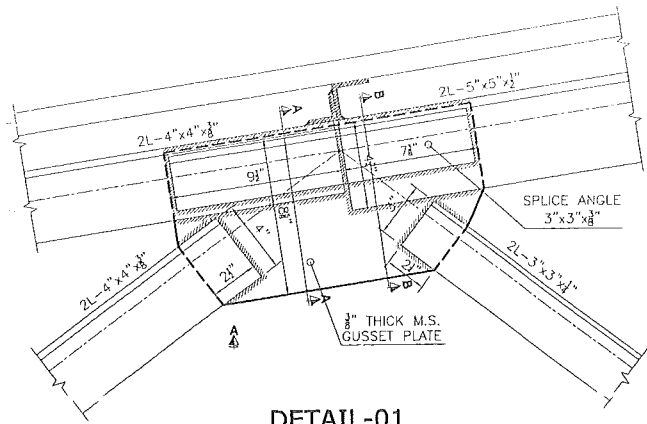
SECTION D-D



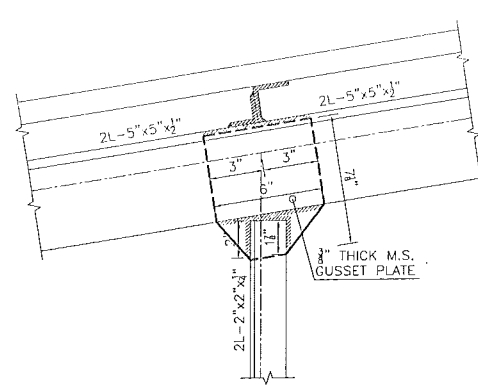
SECTION E-E

SEE DETAIL DRAWING
SBBU-MPH-ST-00

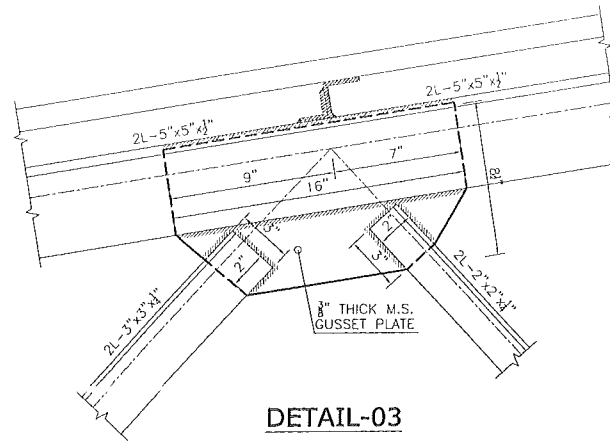
REV	DATE	DESCRIPTION	DRN	CHKD
CONSULTANTS				
ASSOCIATED CONSULTING ENGINEERS-ACE (PVT) LTD.				
Architectural & Town Planning Services, Section				
Ground Floor, 38 Civil Center, M-Block, Model Town Extension, Lahore				
CLIENT				
SHAHED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER				
PROJECT				
MASTER PLANNING ARCHITECTURAL ENGINEERING				
DESIGN & CONSTRUCTION SUPERVISION OF				
UNIVERSITY OF DIR SHERINGAL				
DESCRIPTION				
MULTIPURPOSE HALL				
TRUSS T-02 ELEVATION				
DRAWN BY				
SALMAN				
CHECKED BY				
UMAM RASHEED				
ENGINEER				
APPROVED BY				
UMAM RASHEED				
SCALE				
N.T.S.				
DATE				
May, 2018				
PROJECT NO.				
6073				
DRAWING NO.				
SBBU-MPH-ST-00				



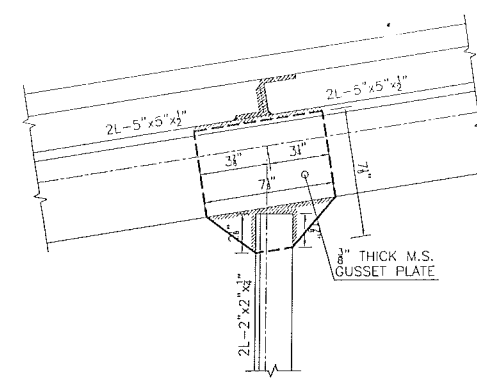
DETAIL-01



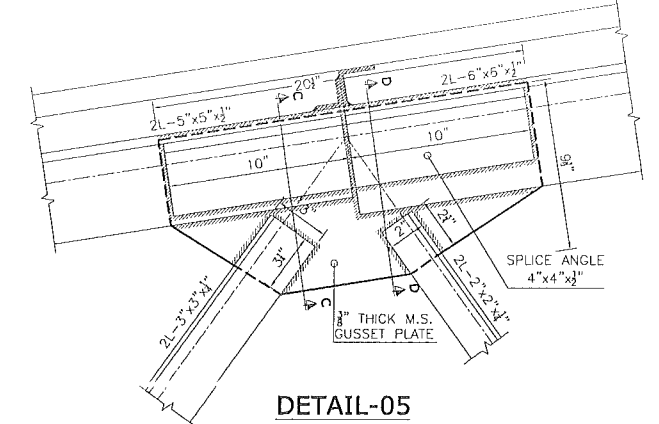
DETAIL-02



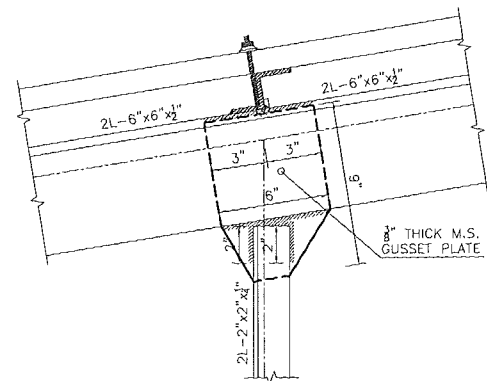
DETAIL-03



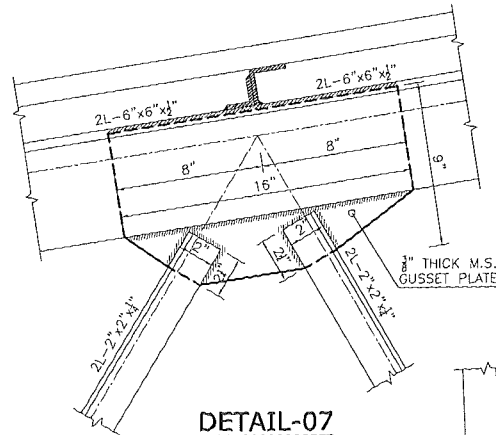
DETAIL-04



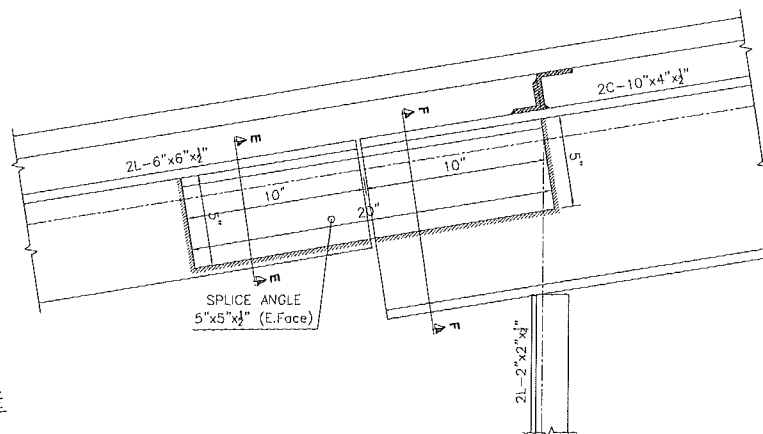
DETAIL-05



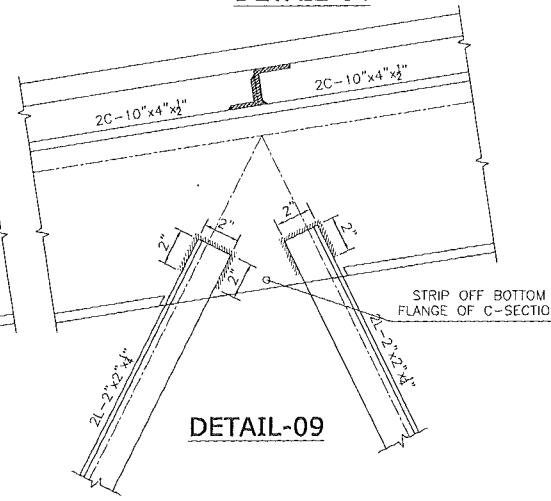
DETAIL-06



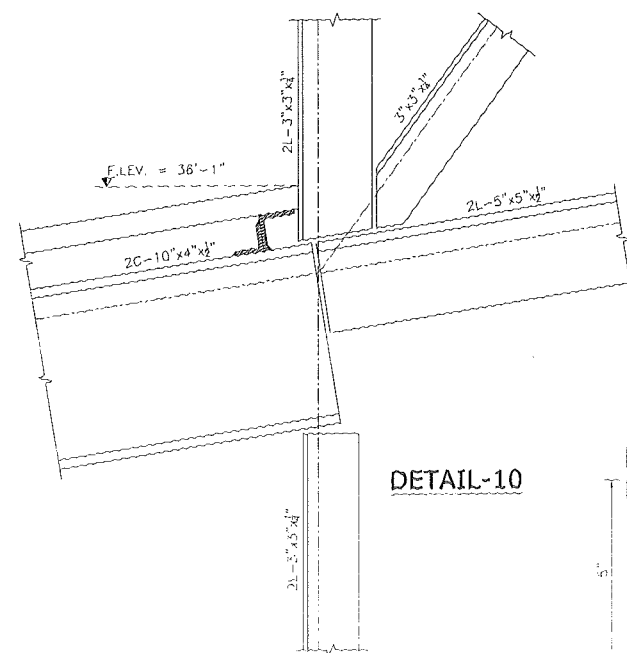
DETAIL-07



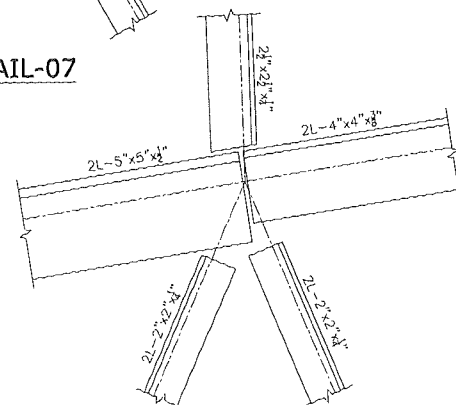
DETAIL-08



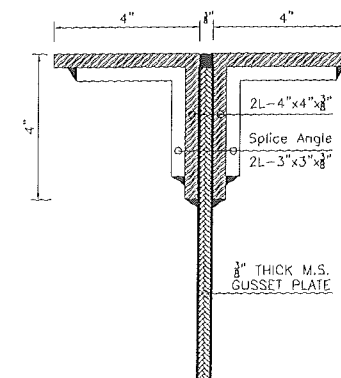
DETAIL-09



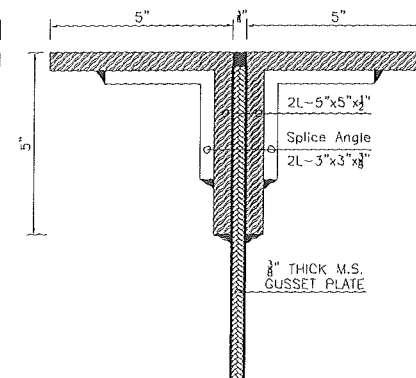
DETAIL-10



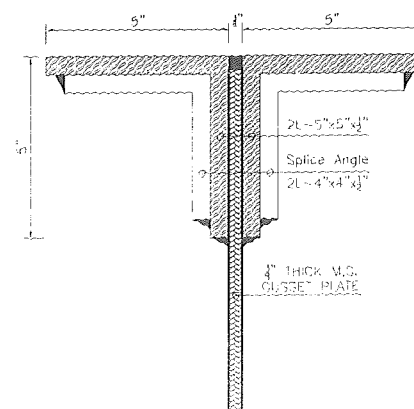
DETAIL-11



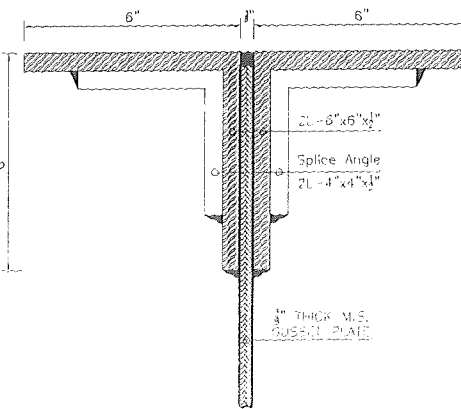
SECTION (A-A)



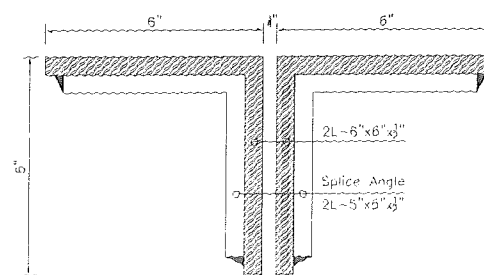
SECTION (B-B)



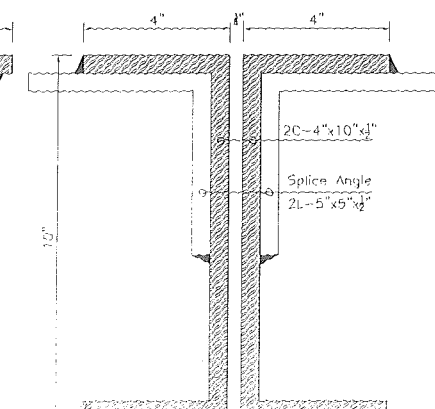
SECTION (C-C)



SECTION (D-D)

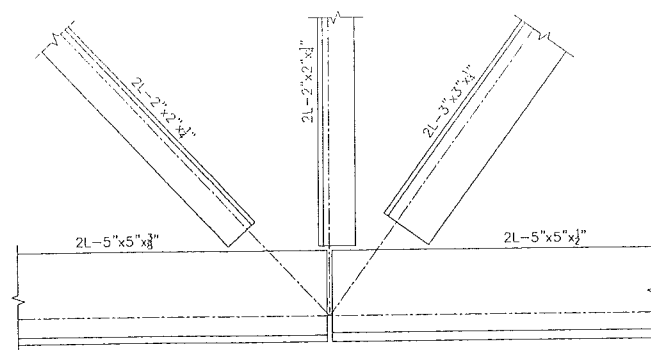


SECTION (E-E)

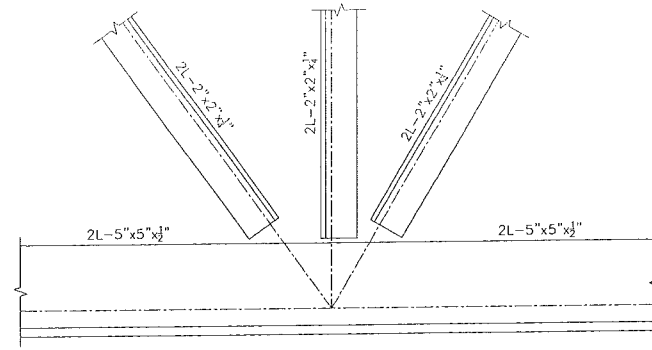


SECTION (F-F)

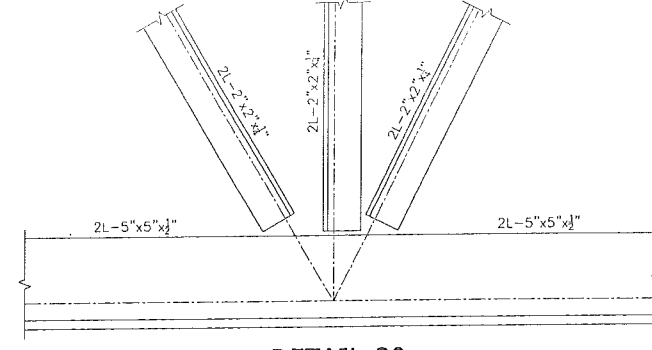
REV	DATE	DESCRIPTION	DRW	CHKD
DRAWN BY		CONSULTANTS		
ASSOCIATED CONSULTING ENGINEERS-ACE (PVT) LTD. Architectural & Town Planning Services, Section Ground Floor, 38 Civic Center, M-Block, Model Town Extension, Lahore				
CALMAN	CHECKED BY	CLIENT		
		SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER		
		PROJECT		
		MASTER PLANNING ARCHITECTURAL, ENGINEERING DESIGN & CONSTRUCTION SUPERVISION OF UNIVERSITY OF DIR SHERINGAL		
MIAN RASHID	ENGINEER	DESCRIPTION		
MULTIPURPOSE HALL				
TRUSS T-02 ELEVATION				
MIAN RASHID	APPROVED BY	DATE	SCALE	7/1/2018
				20
	ST	DATE	6073	EBBU-MPH-ST-10
		May, 2018		



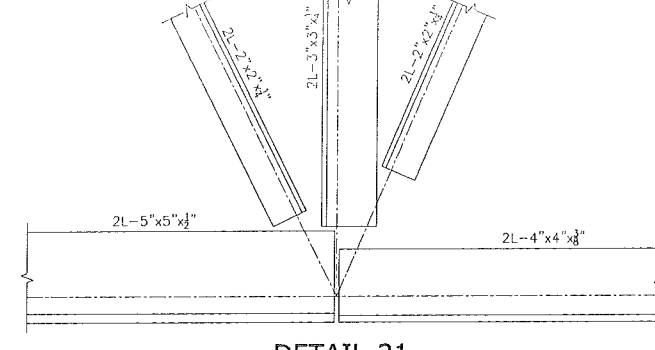
DETAIL-18



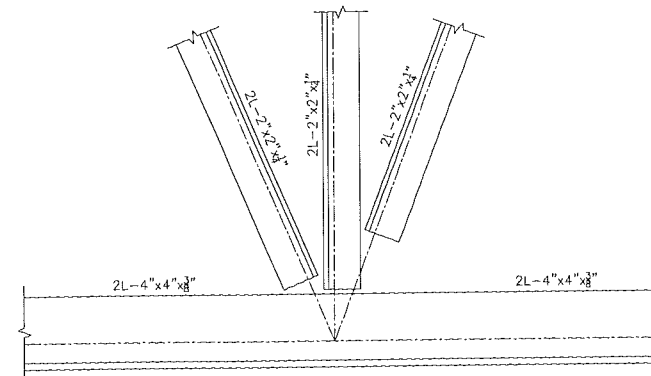
DETAIL-19



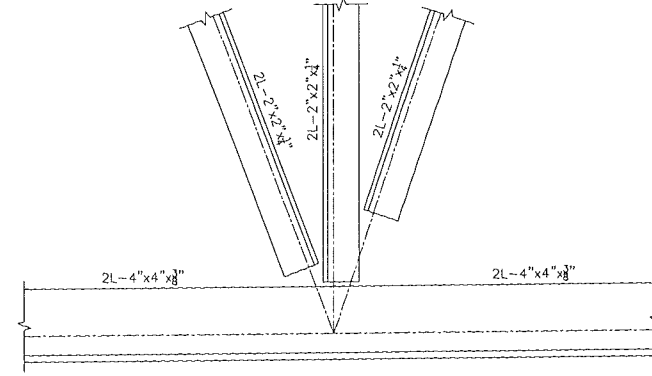
DETAIL-20



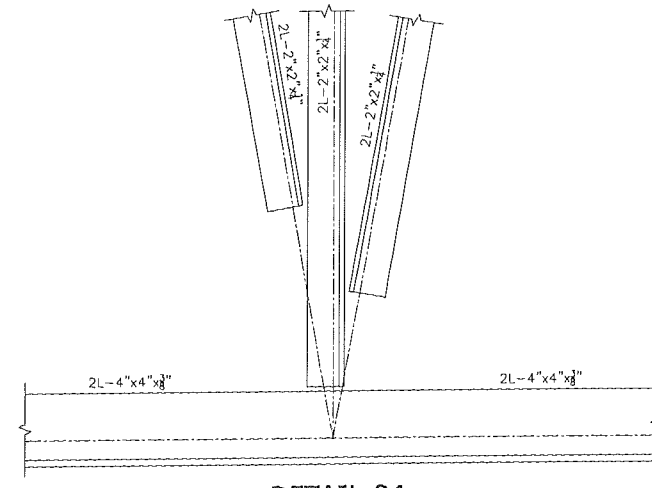
DETAIL-21



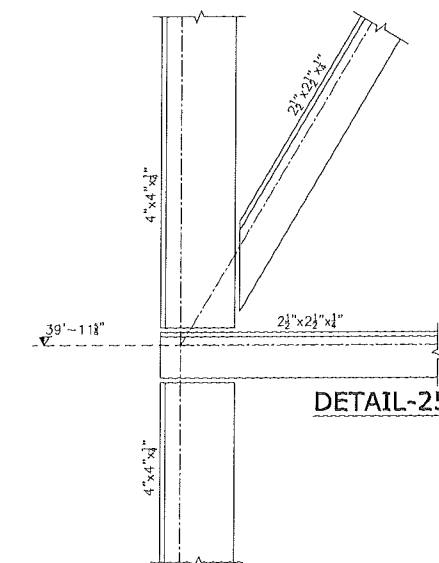
DETAIL-22



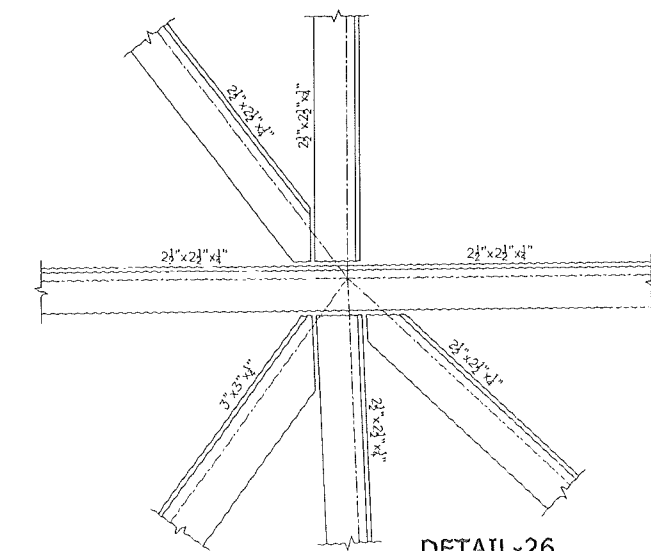
DETAIL-23



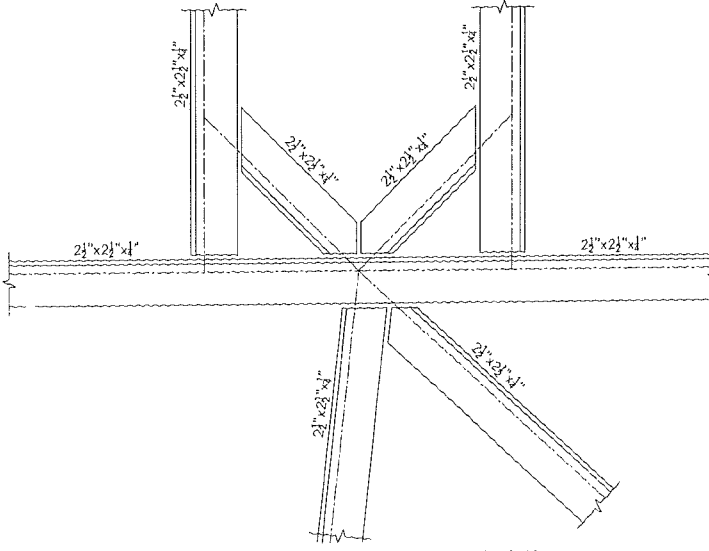
DETAIL-24



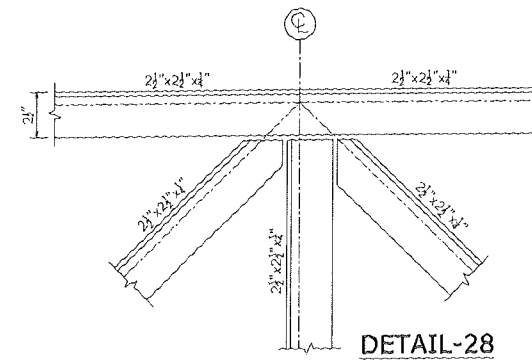
DETAIL-25



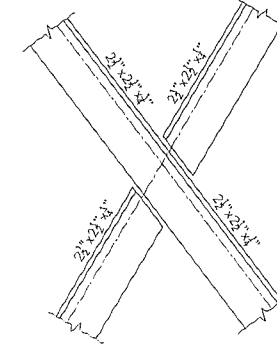
DETAIL-26



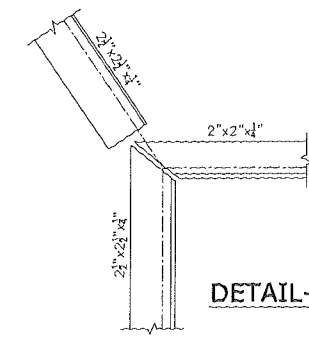
DETAIL-27



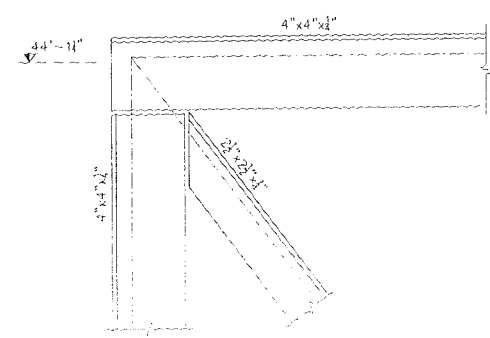
DETAIL-28



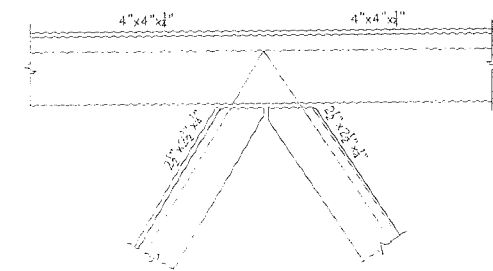
DETAIL-29



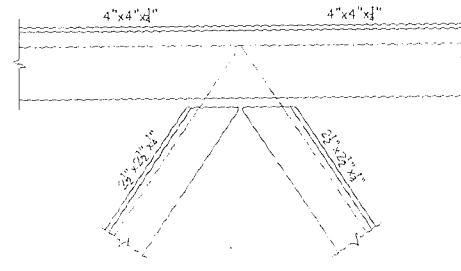
DETAIL-30



DETAIL-31

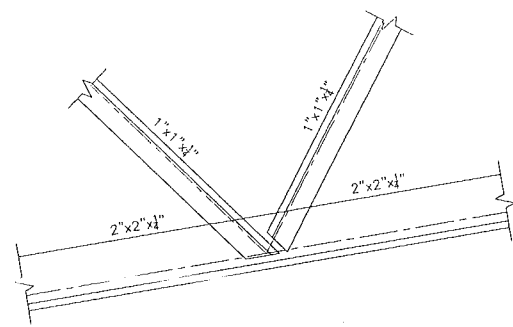


DETAIL-32

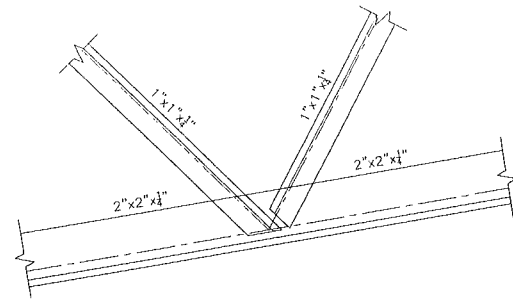


DETAIL-33

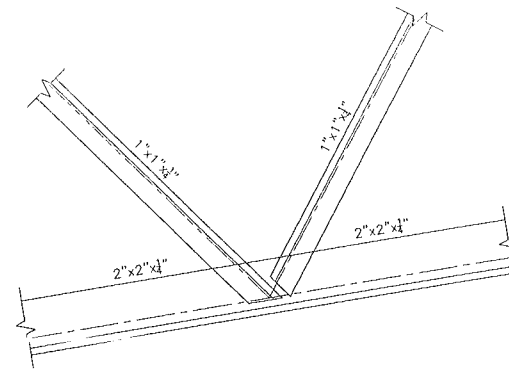
REV	DATE	DESCRIPTION	DRN	CHKD
DRAWN BY CONSULTANTS				
<p>ASSOCIATED CONSULTING ENGINEERS-ACE (PVT) LTD. Architectural & Town Planning Services,Section Ground Floor, 26 Civic Center, M-Block, Model Town Extension, Lahore</p>				
SALMAN				
CHECKED BY CLIENT				
<p>SHAHEED NAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER PROJECT MASTER PLANNING ARCHITECTURAL ENGINEERING DESIGN & CONSTRUCTION SUPERVISION OF UNIVERSITY OF DIR SHERINGAL</p>				
MIAN KASHIF ENGINEER				
DESCRIPTION				
<p>MULTIPURPOSE HALL TRUSS T-02 ELEVATION</p>				
<p>MIAN KASHIF ARCHITECT</p>				
DATE	SCALE	NO.	DATE	21
14 Aug 2015	1:1	6073	14 Aug 2015	21
SIT		May, 2015	6073	SBBL MPH-ET 20



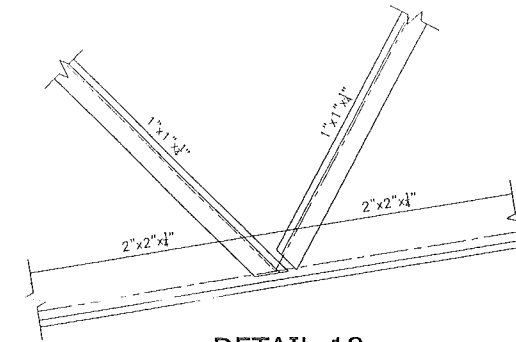
DETAIL-15



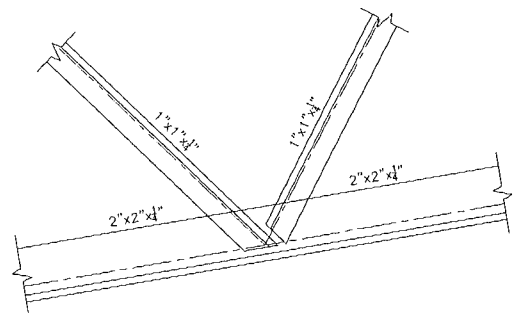
DETAIL-16



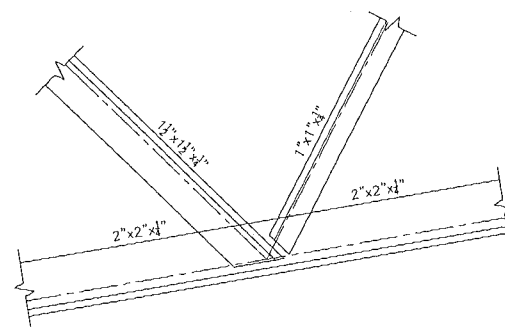
DETAIL-17



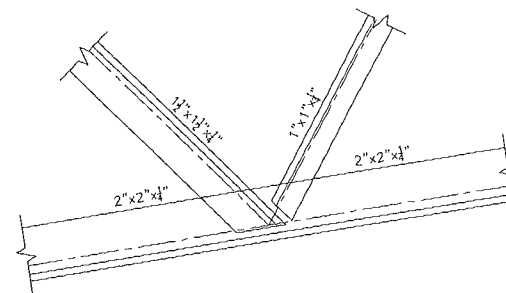
DETAIL-18



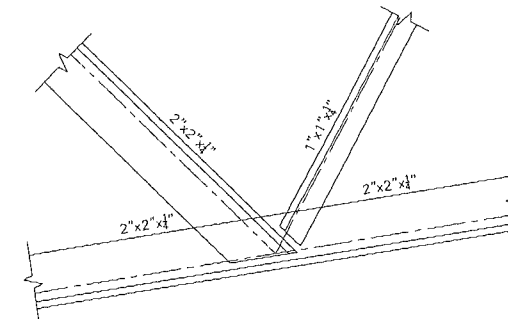
DETAIL-19



DETAIL-20

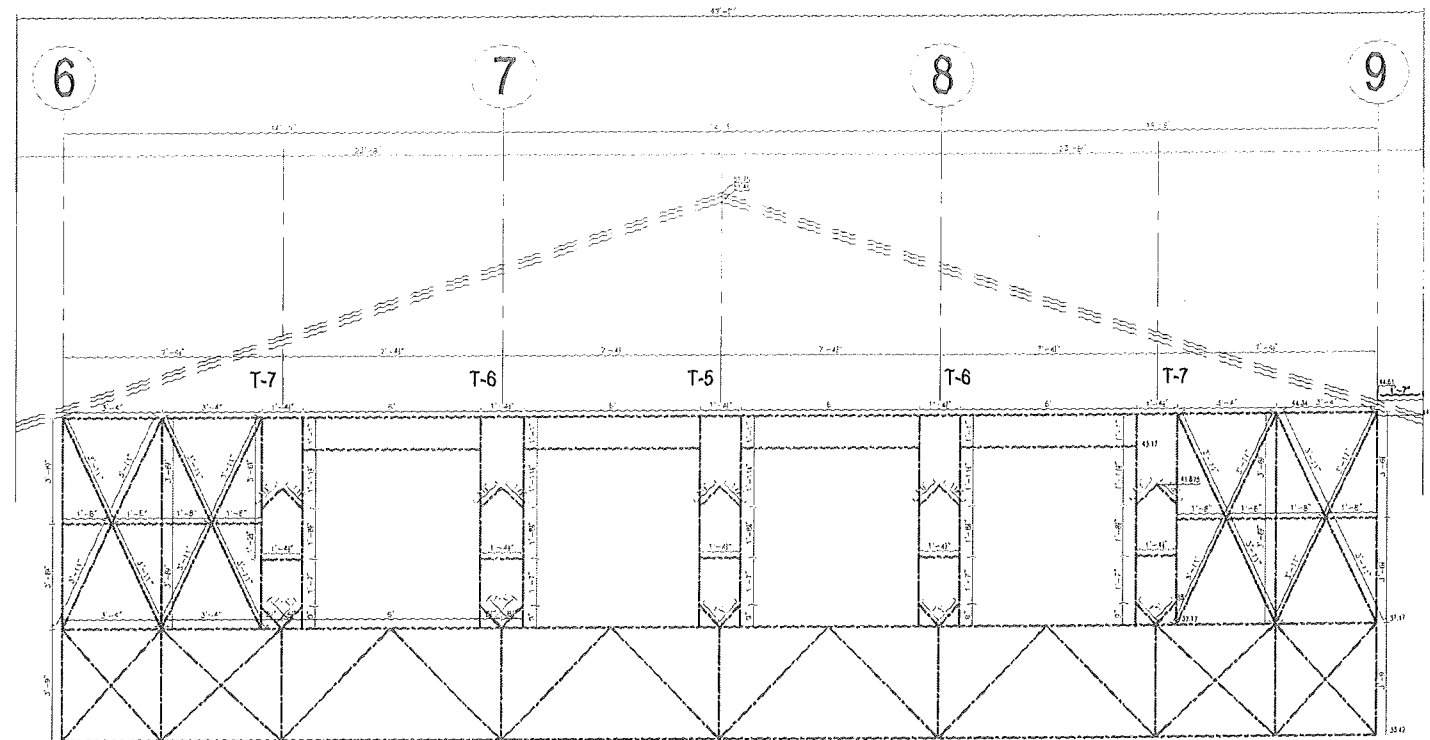


DETAIL-21

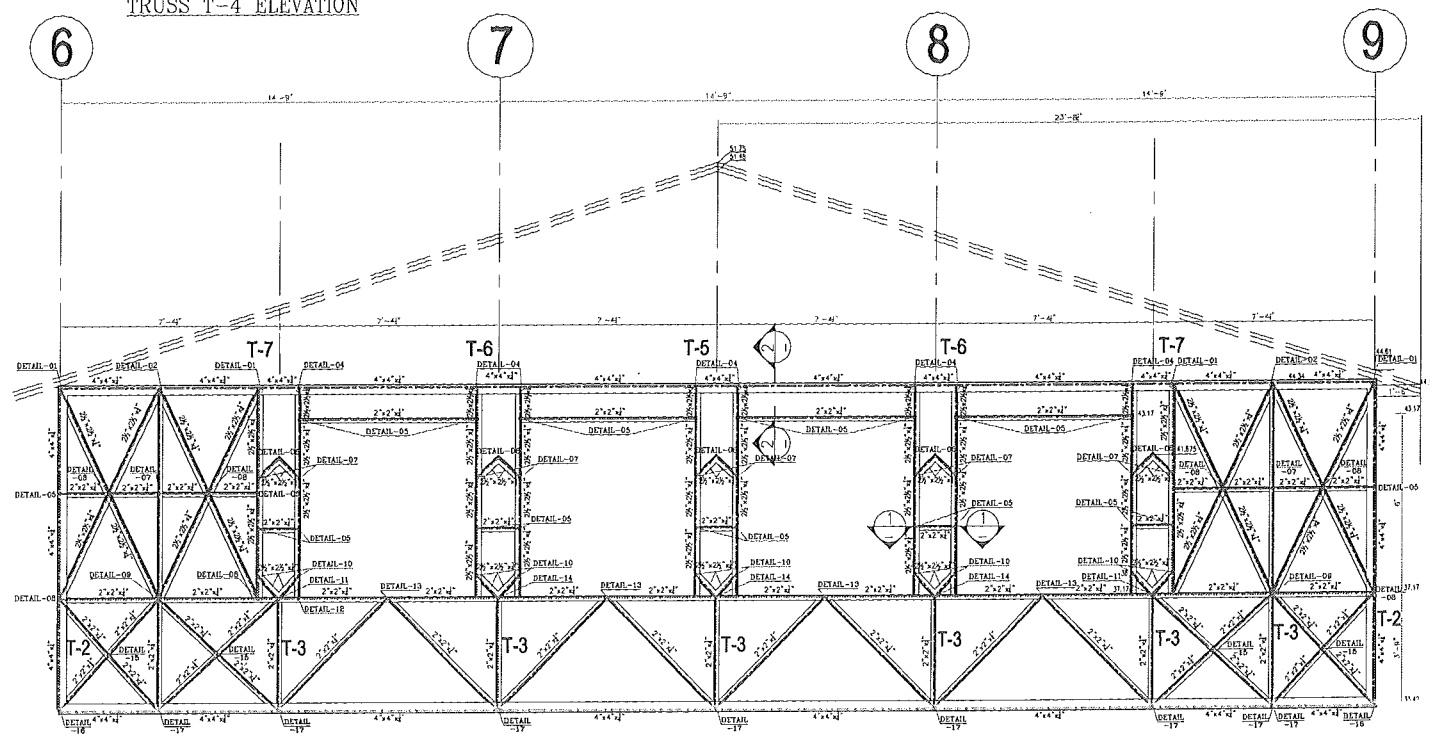


DETAIL-22

REV	DATE	DESCRIPTION	DRN	CHKD
DRAWN BY CONSULTANTS				
ASSOCIATED CONSULTING ENGINEERS-ACE (PVT) LTD.				
Architectural & Town Planning Services, Section				
Ground Floor, 3D Civic Center, M-Block, Model Town Extension, Lahore				
CHECKED BY CLIENT				
SHAHED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER				
PROJECT MASTER PLANNING ARCHITECTURAL ENGINEERING				
DESIGN & CONSTRUCTION SUPERVISION OF				
UNIVERSITY OF DIR SHERINGAL				
ENGINEER DESCRIPTION				
MULTIPURPOSE HALL				
TRUSS T-3 ELEVATION &				
JOINT DETAIL				
MAN HASHEED				
APPROVED BY				
ST				
March, 2018				
6073 SBBC-MPH ST-23				

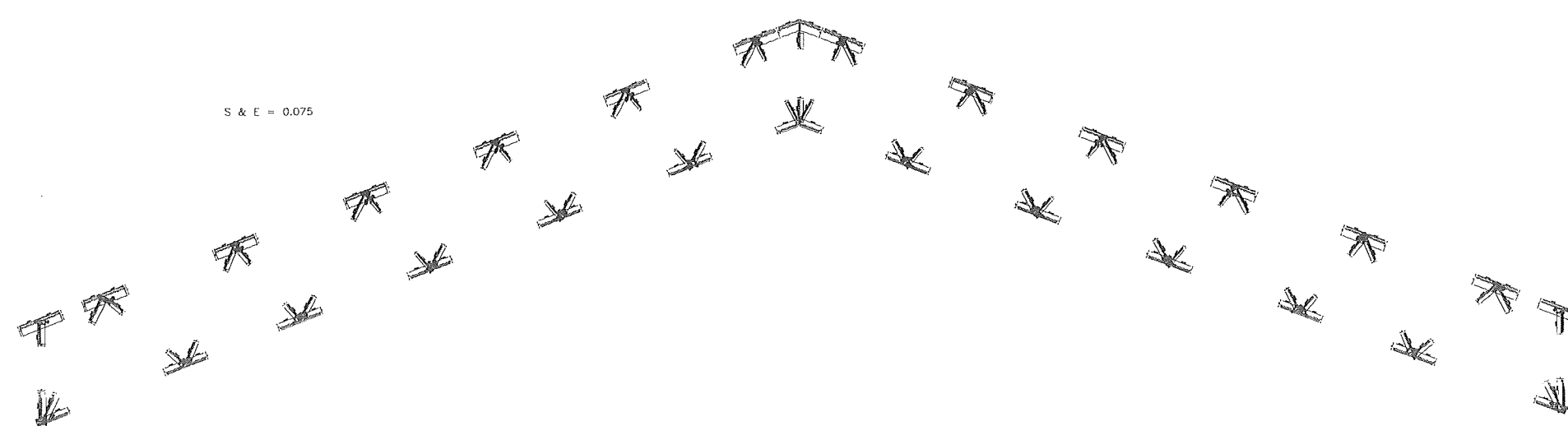
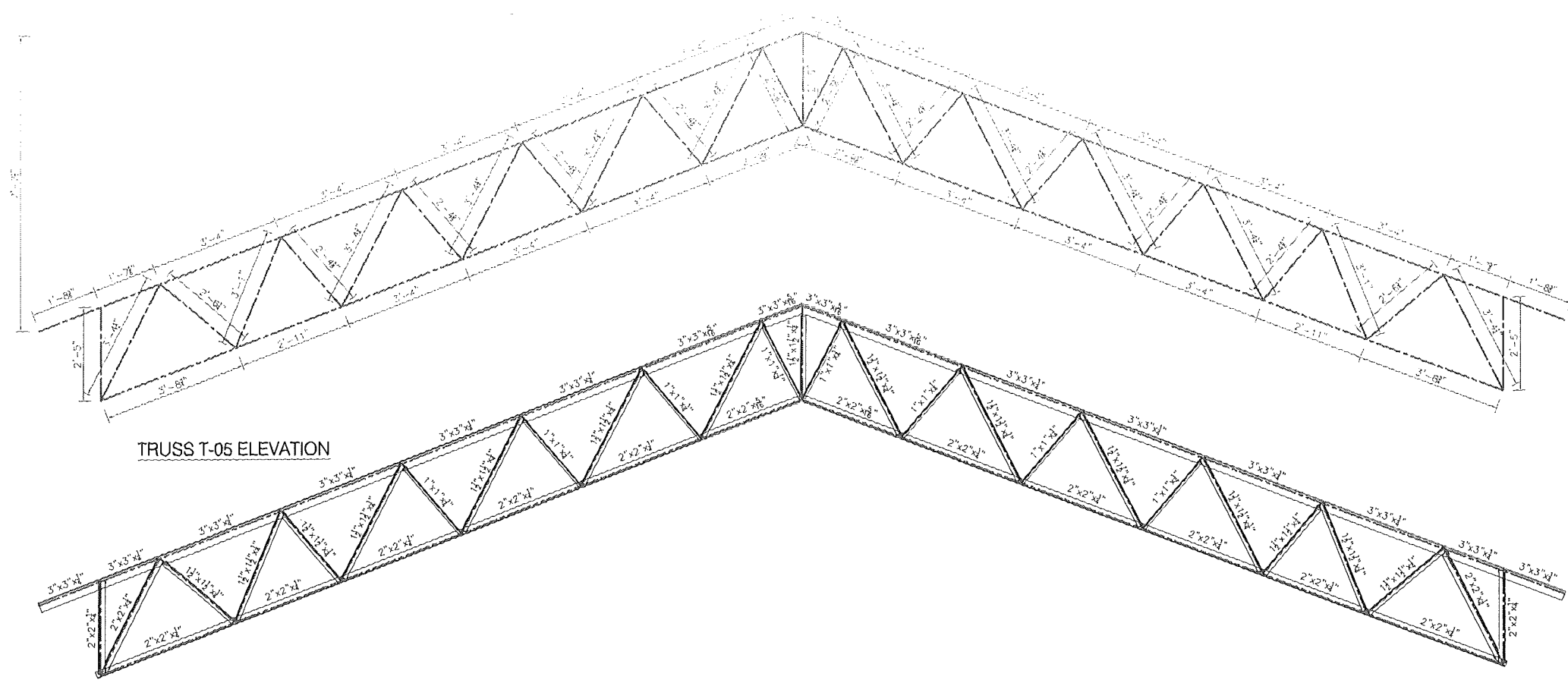


TRUSS T-4 ELEVATION



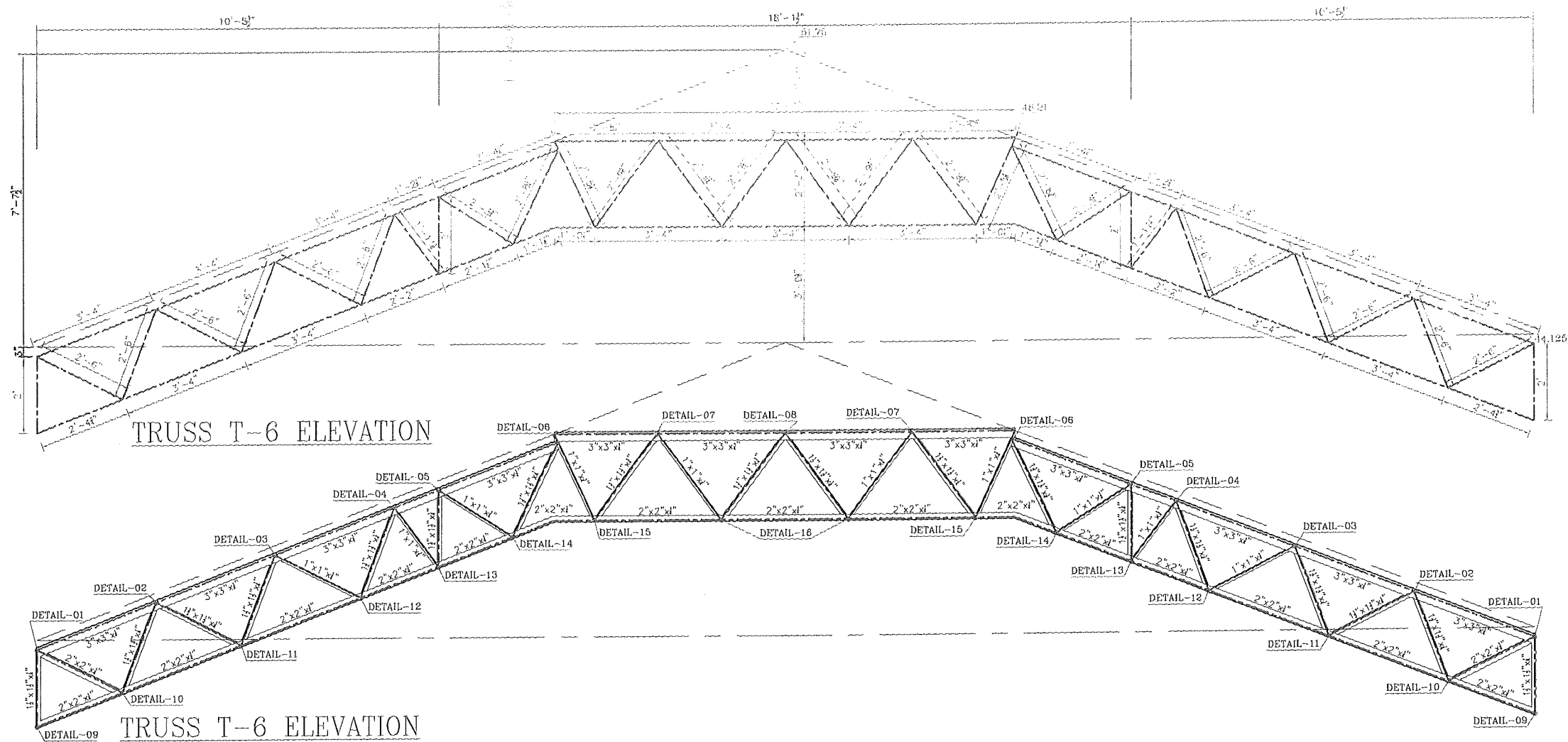
TRUSS T-4 ELEVATION

REV	DATE	DESCRIPTION	DRN	CHKD
DRAWN BY:		CONSULTANTS		
SOHAIL		ASSOCIATED CONSULTING ENGINEERS-ACE (PVT) LTD.		
CHECKED BY:		Architectural & Town Planning Services, Section		
CLIENT:		Ground Floor, 36 Civic Center, M-Block, Model Town Extension, Lahore		
PROJECT:		SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER		
ENGINEER		MASTER PLANNING ARCHITECTURAL ENGINEERING		
		DESIGN & CONSTRUCTION SUPERVISION OF		
		UNIVERSITY OF DIR SHERINGAL		
DESCRIPTION		MULTIPURPOSE HALL		
		TRUSS T-04 ELEVATION &		
		JOINT DETAIL		
APPROVED BY:	TYPE	SCALE	JOB NO	DWG NO
I.H. ALVI	ST	N.T.S.	6073	24
	DATE	March, 2018		



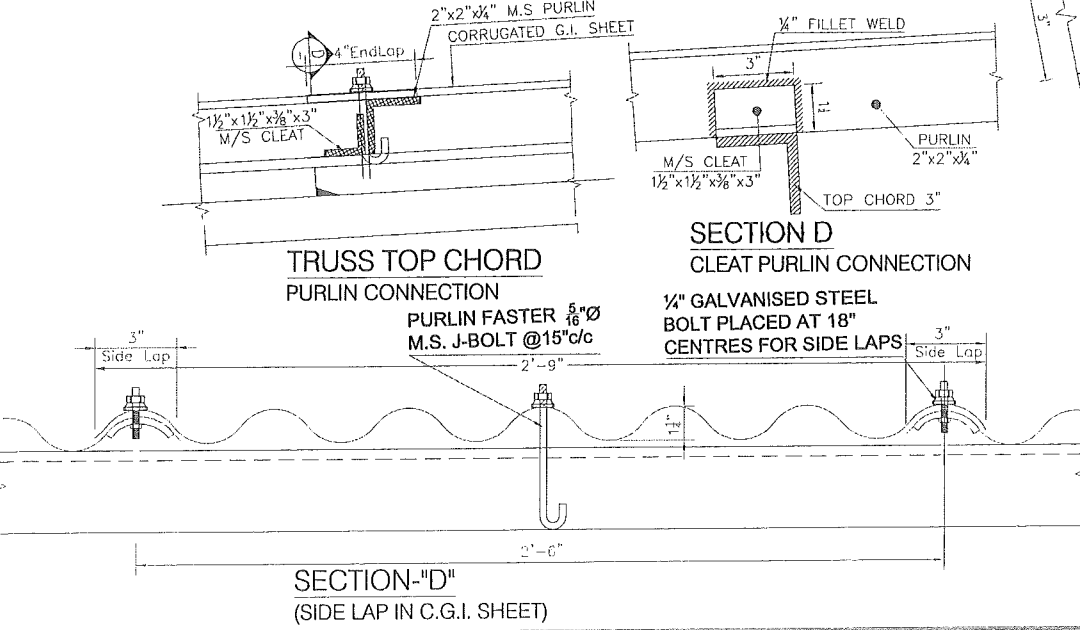
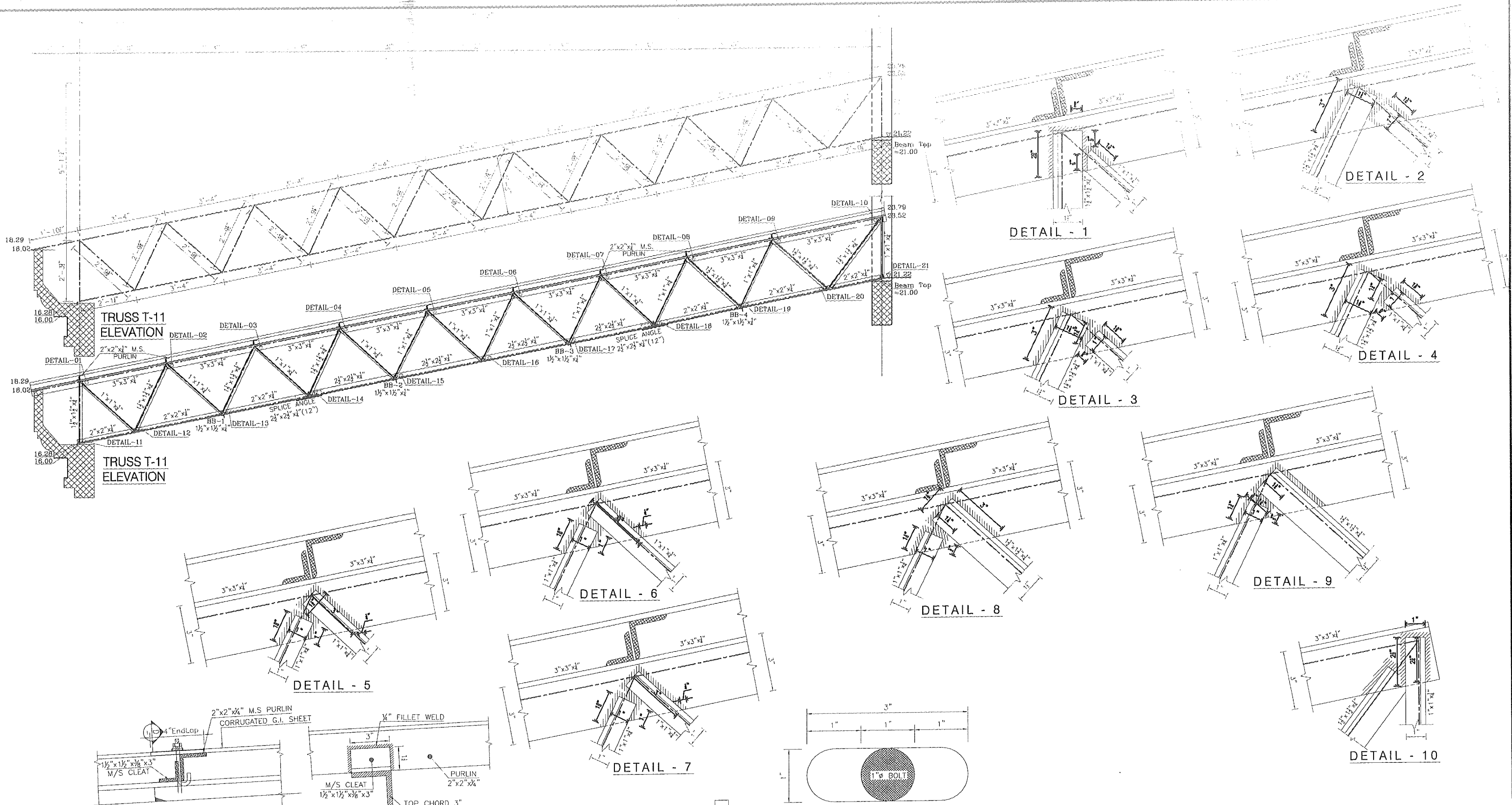
S & E = 0.075

REV.	DATE	DESCRIPTION	DRN	CHKD.
DRAWN BY: CONSULTANTS:				
ASSOCIATED CONSULTING ENGINEERS-ACE (PVT) LTD.				
Architectural & Town Planning Services, Section				
Ground Floor, 36 Civic Center, M-Block, Model Town Extension, Lahore				
CHECKED BY: CLIENT:				
SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER				
PROJECT: MASTER PLANNING ARCHITECTURAL ENGINEERING				
DESIGN & CONSTRUCTION SUPERVISION OF				
UNIVERSITY OF DIR SHERINGAL				
ENGINEER DESCRIPTION:				
MULTIPURPOSE HALL				
TRUSS T-5 ELEVATION & JOINT DETAIL				
M.I.A. RASHEED APPROVED BY:		TYPE	SCALE	DATE
I.H. ALVI		ST	N.T.S.	March, 2018
		JOB NO.	DRG NO.	
		6073	25	
		SBBU-MPH-ST-004		



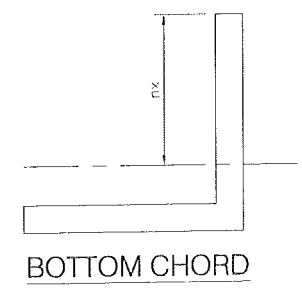
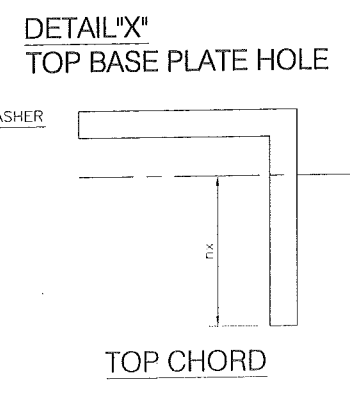
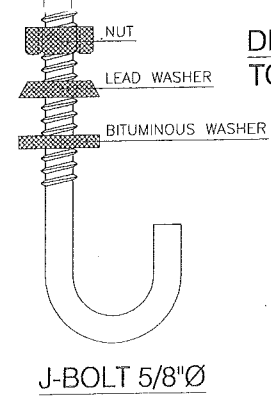
Note: For Estimate take T-07 (2 Nos) same as T-06.
Drawing ST-27 will be provided later.

REV	DATE	DESCRIPTION	DRN	CHKD
DRAWN BY: CONSULTANTS				
ASSOCIATED CONSULTING ENGINEERS-ACE (PVT) LTD.				
Architectural & Town Planning Services, Section				
Ground Floor, 38 Civic Center, M-Block, Model Town Extension, Lahore				
CHECKED BY: CLIENT				
SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER				
PROJECT: MASTER PLANNING ARCHITECTURAL, ENGINEERING				
DESIGN & CONSTRUCTION SUPERVISION OF				
UNIVERSITY OF DIR SHERINGAL				
ENGINEER: DESCRIPTION				
MULTIPURPOSE HALL				
TRUSS T-6 ELEVATION & JOINT DETAIL				
APPROVED BY: TYPE SCALE N.T.S. JOB NO. DFC NO.				
DATE March, 2018 6073 SBRU-MPH-ST-25				
L.H. ALVI				

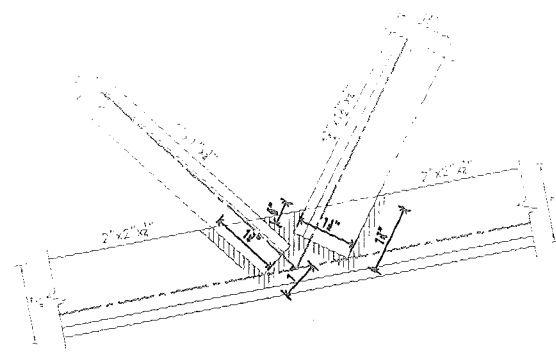


ANGLE IRON NEUTRAL AXIS

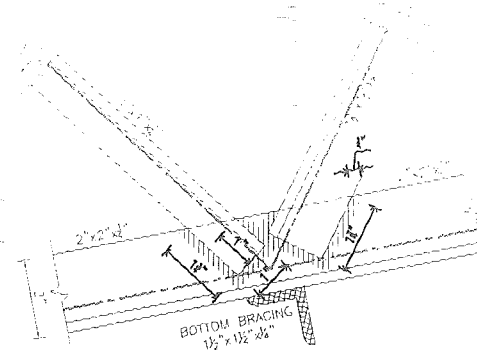
ANGLE SIZE	nX
1"x1"x4"	0.67
1 1/2"x1 1/2"x4"	0.80
1 1/2"x1 1/2"x4"	1.04
2"x2"x4"	1.42
2"x2"x6"	1.39
3"x3"x4"	2.17
4"x4"x4"	1.39



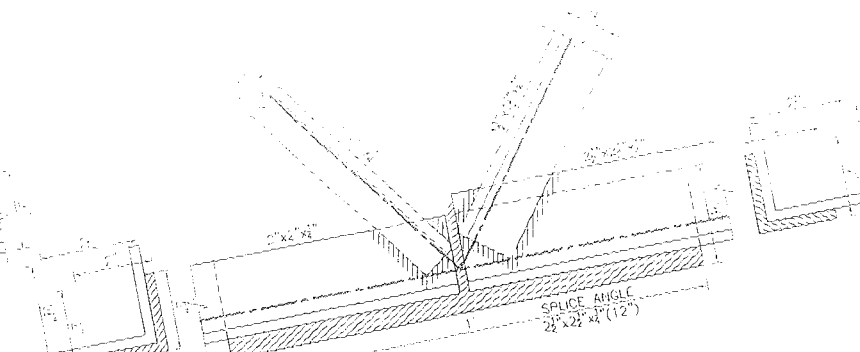
REV	DATE	DESCRIPTION	DRN	CHKD.
DRAWN BY: CONSULTANTS SALMAN ASSOCIATED CONSULTING ENGINEERS-ACE (PVT) LTD. CHECKED BY: Architectural & Town Planning Services, Section Ground Floor, 36 Civic Center, M-Block, Model Town Extension, Lahore CLIENT: SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER PROJECT: MASTER PLANNING ARCHITECTURAL ENGINEERING DESIGN & CONSTRUCTION SUPERVISION OF UNIVERSITY OF DIR SHERINGAL ENGINEER: MIAN RASHEED DESCRIPTION: MULTIPURPOSE HALL TRUSS T-11 ELEVATION & JOINT DETAIL MAN. RASHEED APPROVED BY: TYPE: SCALE: N.T.S. JOB NO: DRS NO: 28 I.H. ALVI ST DATE: March, 2018 6073 SBBU-MPH-ST-20				



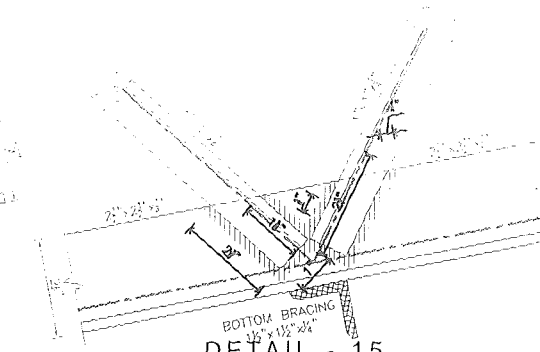
DETAIL - 12



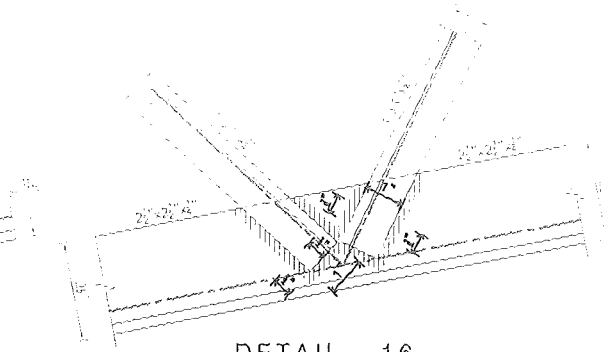
DETAIL - 13



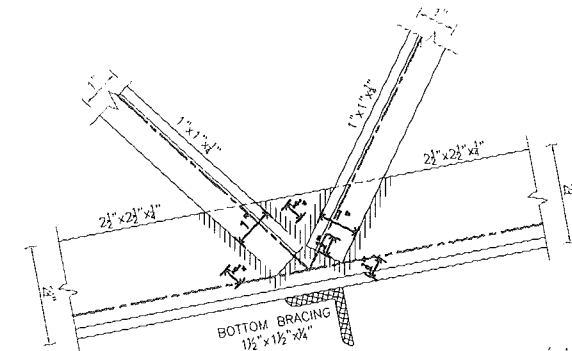
DETAIL - 14



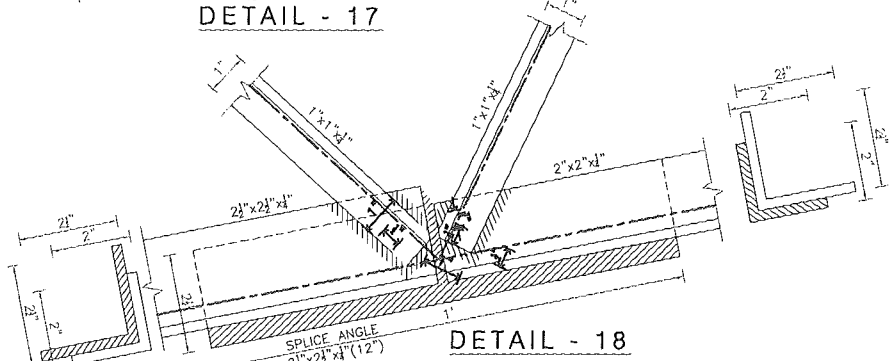
DETAIL - 15



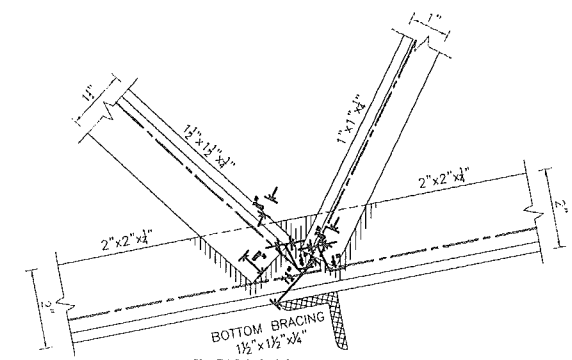
DETAIL - 16



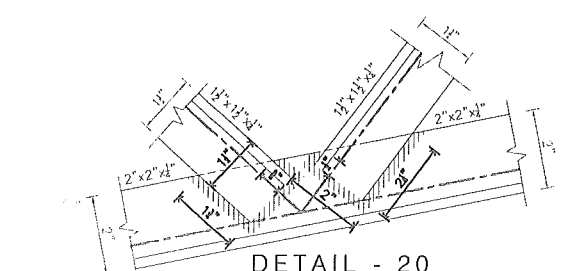
DETAIL - 17



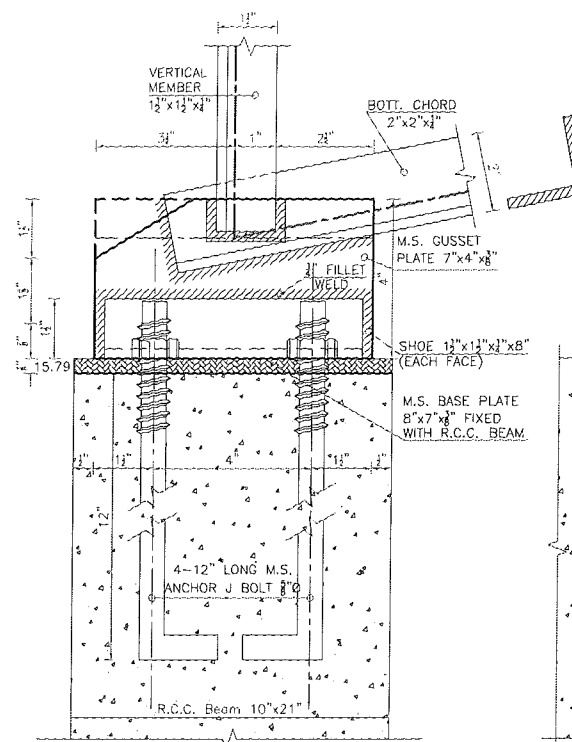
DETAIL - 18



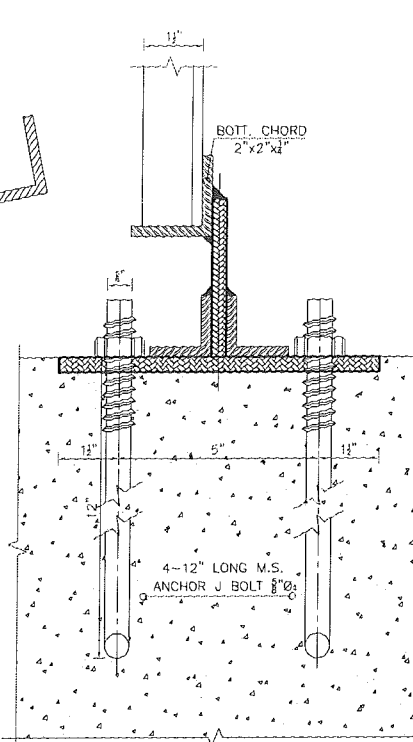
DETAIL - 19



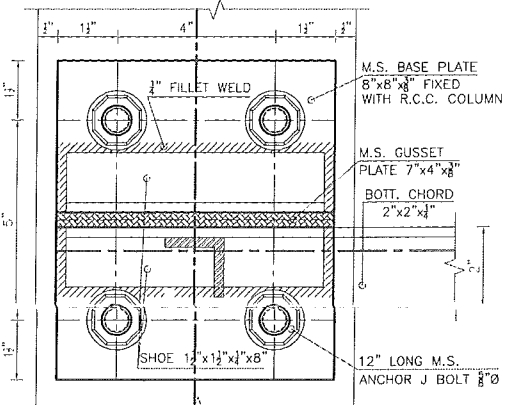
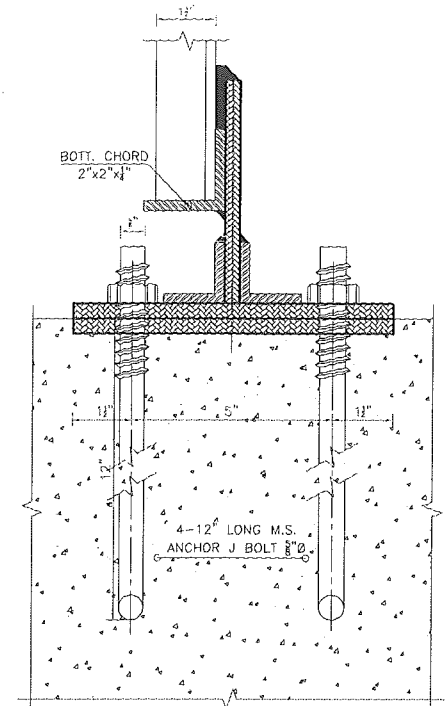
DETAIL - 20



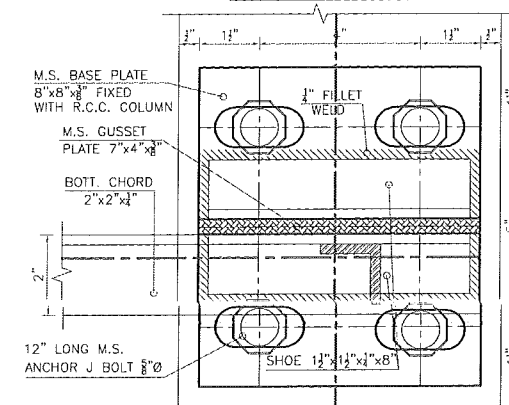
DETAIL - 11



DETAIL - 21

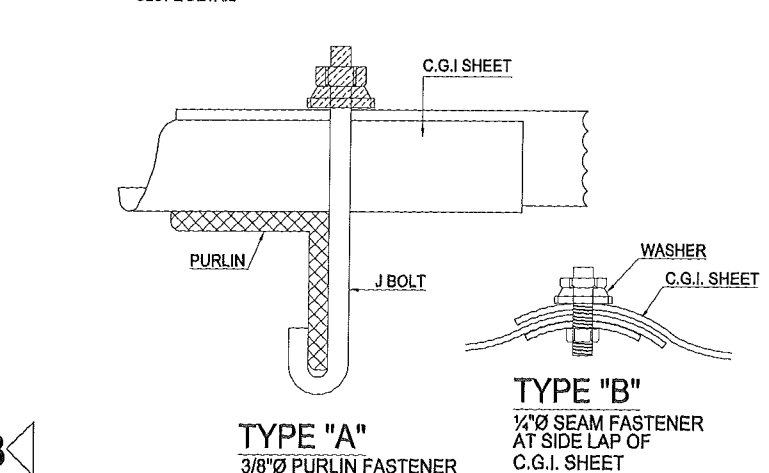
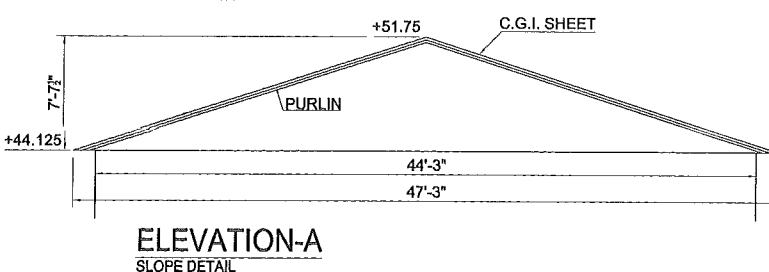
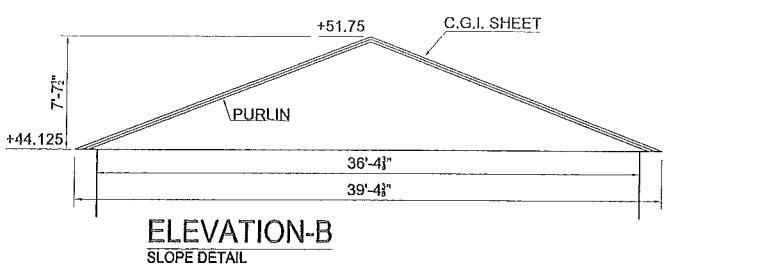
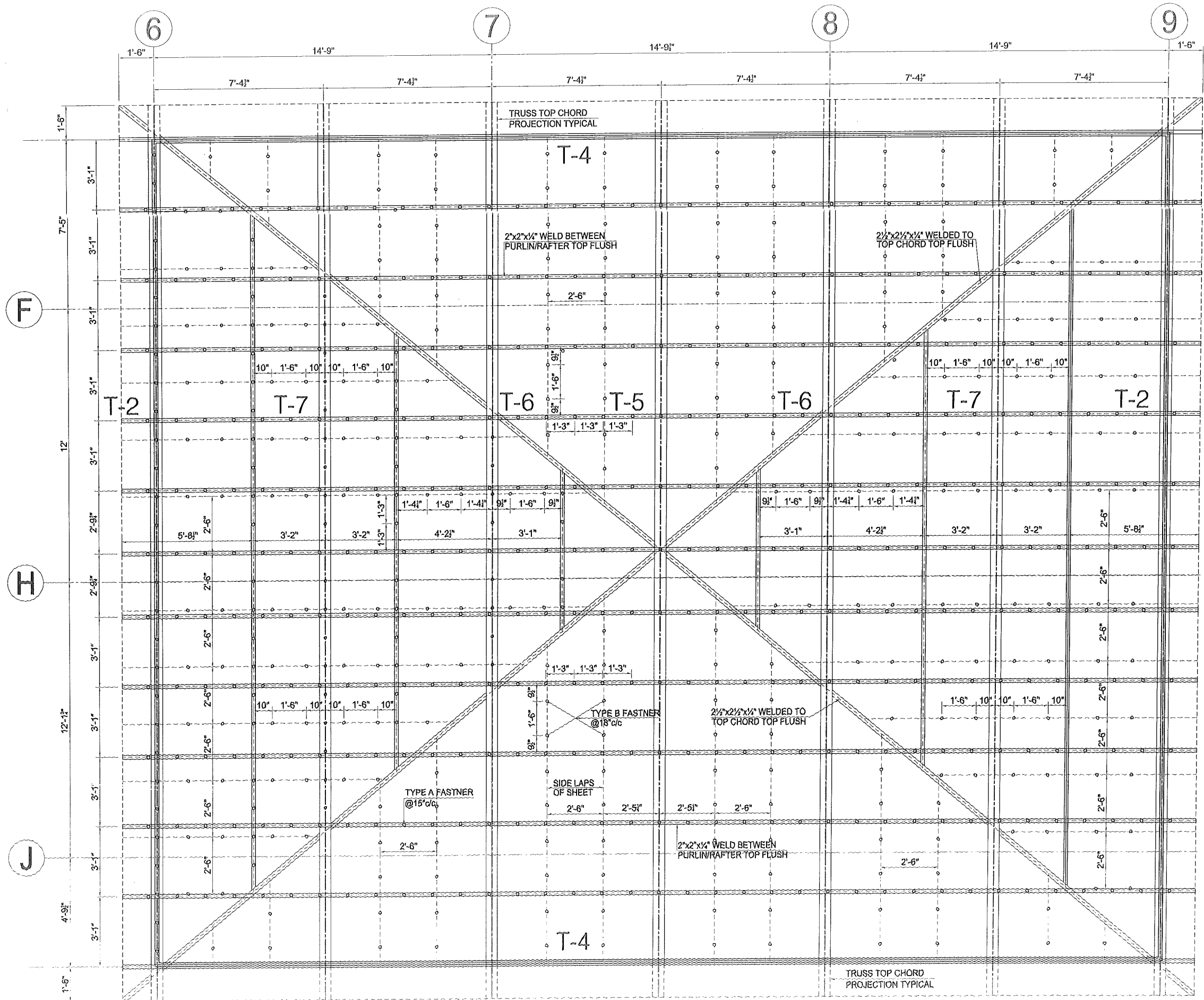


PLAN
AT FIXED END



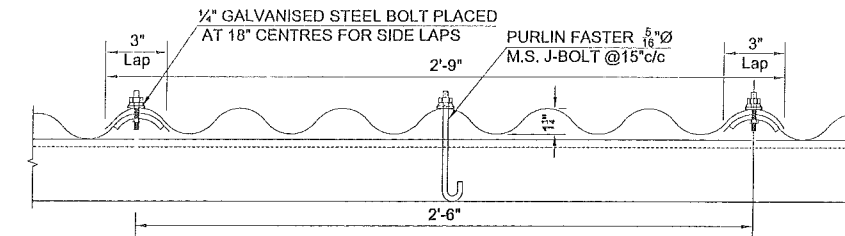
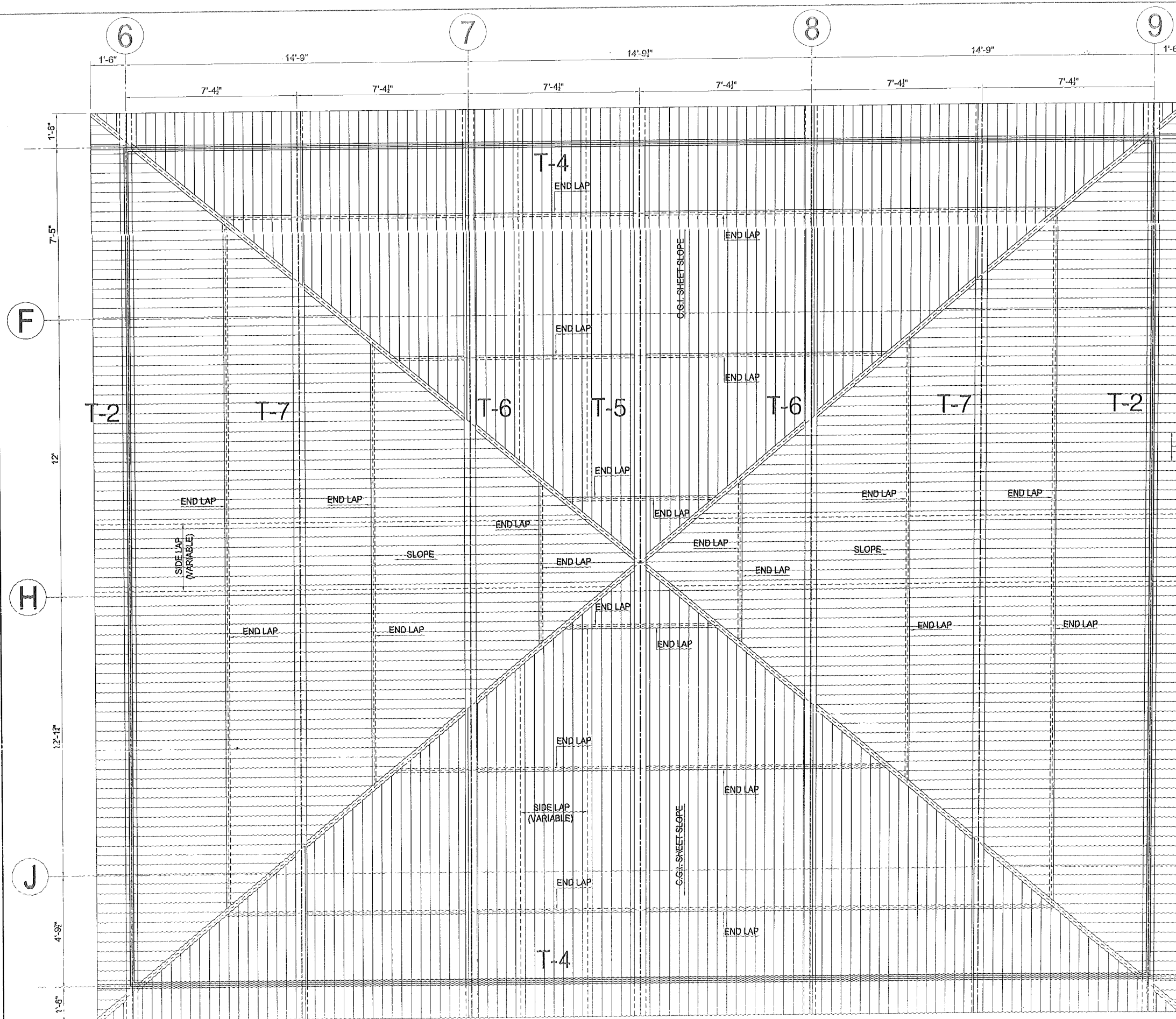
PLAN
AT MOVING END

REV.	DATE	DESCRIPTION	DRN.	CHKD.
DRAWN BY:		CONSULTANTS:		
SALMAN		ASSOCIATED CONSULTING ENGINEERS-ACE (PVT) LTD.		
CHECKED BY:		Architectural & Town Planning Services, Section		
MIAN RASHEED		Ground Floor, 36 Civic Center, M-Block, Model Town Extension, Lahore		
ENGINEER		CLIENT:		
		SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER		
		PROJECT:		
		MASTER PLANNING ARCHITECTURAL, ENGINEERING		
		DESIGN & CONSTRUCTION SUPERVISION OF		
		UNIVERSITY OF DIR SHERINGAL		
		DESCRIPTION:		
		MULTIPURPOSE HALL		
		TRUSS T-11 ELEVATION &		
		JOINT DETAIL		
APPROVED BY:		TYPE	SCALE	DATE
L.H. ALVI		ST	N.T.S.	March, 2018
			JOB NO	6073
			DRG NO	SBBU-MPH-ST-27



TRUSSES & PURLIN LAYOUT PLAN
SHOWING PURLIN, FASTENERS & SIDE LAPS FASTENERS

REV	DATE	DESCRIPTION	DRN	CHKD
DRAWN BY		CONSULTANTS		
MUNIR		ASSOCIATED CONSULTING ENGINEERS-ACE (PVT) LTD. Architectural & Town Planning Services, Section Ground Floor, 36 Civic Center, M-Block, Model Town Extension, Lahore		
CHECKED BY		CLIENT		
MAN. RASHID		SHAHED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER		
ENGINEER		PROJECT MASTER PLANNING ARCHITECTURAL, ENGINEERING DESIGN & CONSTRUCTION SUPERVISION OF UNIVERSITY OF DIR SHERINGAL		
DRAWN BY		DESCRIPTION		
MAN. RASHID		MULTIPURPOSE HALL		
ENGINEER		TRUSSES & PURLIN LAYOUT PLAN		
DATE		SCALE		
15/06/2013		1:10		
AS/MD		6073	SBBU-MPH-ST-12	



SECTION-'D'
(SIDE LAP IN C.G.I. SHEET)

SHEET PROJECTION
(TYPICAL)

TRUSSES / PURLIN & C.G.I. SHEETING LAYOUT PLAN

NOTE:-

SIDE LAP/END LAPS ARE INDICATIVE
& LIABLE TO CHANGE FOR AVAILABLE SHEET SIZE

REV	DATE	DESCRIPTION	DRN	CHKD
DRAWN BY	CONSULTANTS	ASSOCIATED CONSULTING ENGINEERS-ACE (PVT) LTD. Architectural & Town Planning Services, Section Ground Floor, 38 Civic Center, M-Block, Model Town Extension, Lahore		
CHECKED BY	CLIENT	SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER		
MAN. BY	ENGINEER	MASTER PLANNING ARCHITECTURAL, ENGINEERING DESIGN & CONSTRUCTION SUPERVISION OF UNIVERSITY OF DIR SHERINGAL		
APPROVED BY	DATE	MULTIPURPOSE HALL TRUSSES / PURLIN & C.G.I. SHEETING LAYOUT PLAN		
DATE	2018	6073	31	

TENDER DRAWINGS
FOR
MULTIPURPOSE HALL
DEVELOPMENT OF UNIVERSITY OF DIR,
SHERINGAL, DIR UPPER

SR. NO.	DESCRIPTION	DRG. NO.
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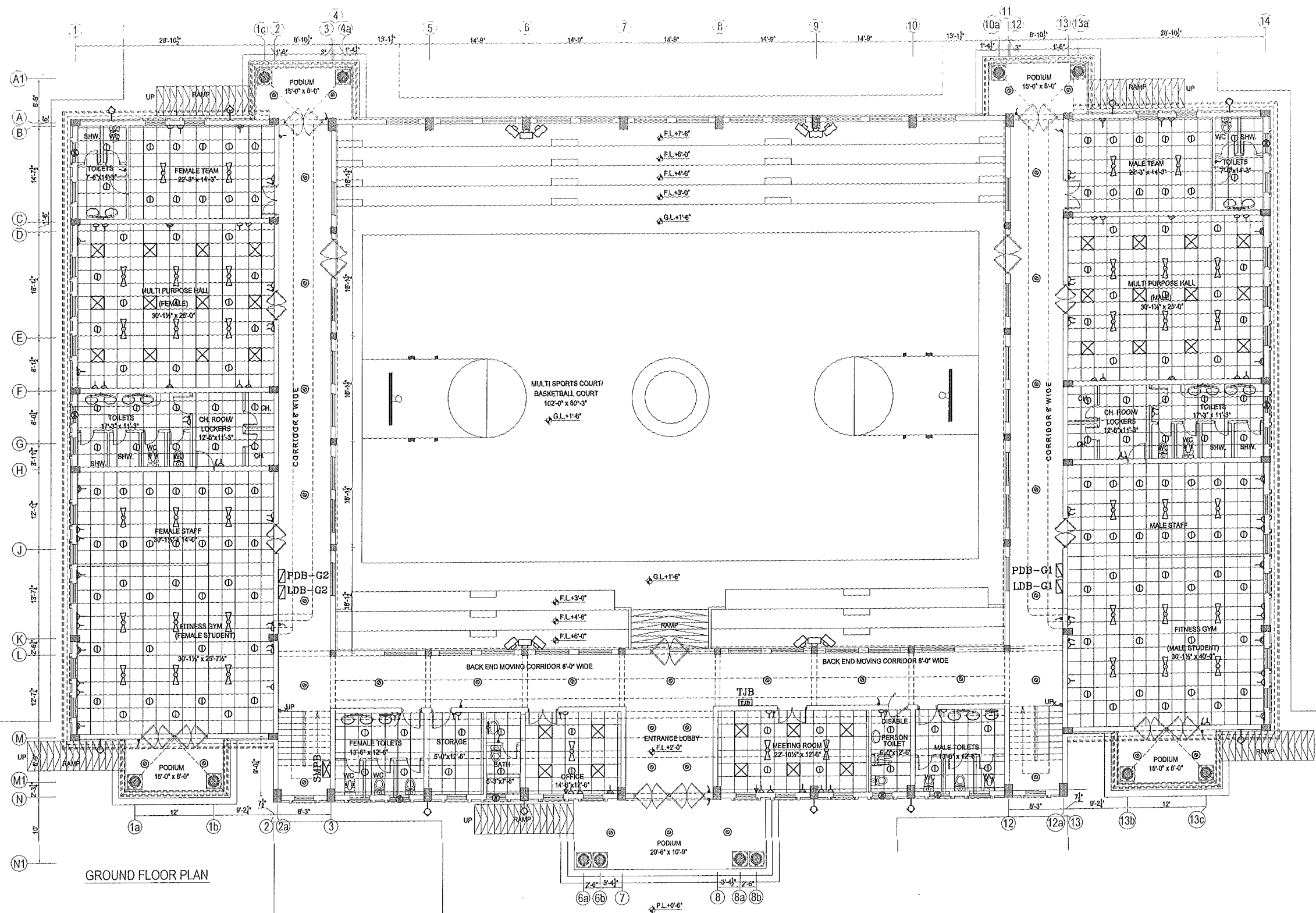
ELECTRICAL

1	ELECTRICAL LAYOUT PLAN (GROUND FLOOR)	SBBU-MPH-EE-01
2	ELECTRICAL LAYOUT PLAN (FIRST FLOOR)	SBBU-MPH-EE-02
3	SINGLE LINE DIAGRAM FOR DISTRIBUTION BOARD	SBBU-MPH-EE-03
4	SINGLE LINE DIAGRAM FOR SUB MAIN PANEL BOARD	SBBU-MPH-EE-04
5	CCTV SYSTEM LAYOUT PLAN (GROUND FLOOR)	SBBU-MPH-EE-05
6	DETAIL OF EARTHING ARRANGEMENT	SBBU-MPH-EE-06

AUGUST: 2018
CONSULTANTS



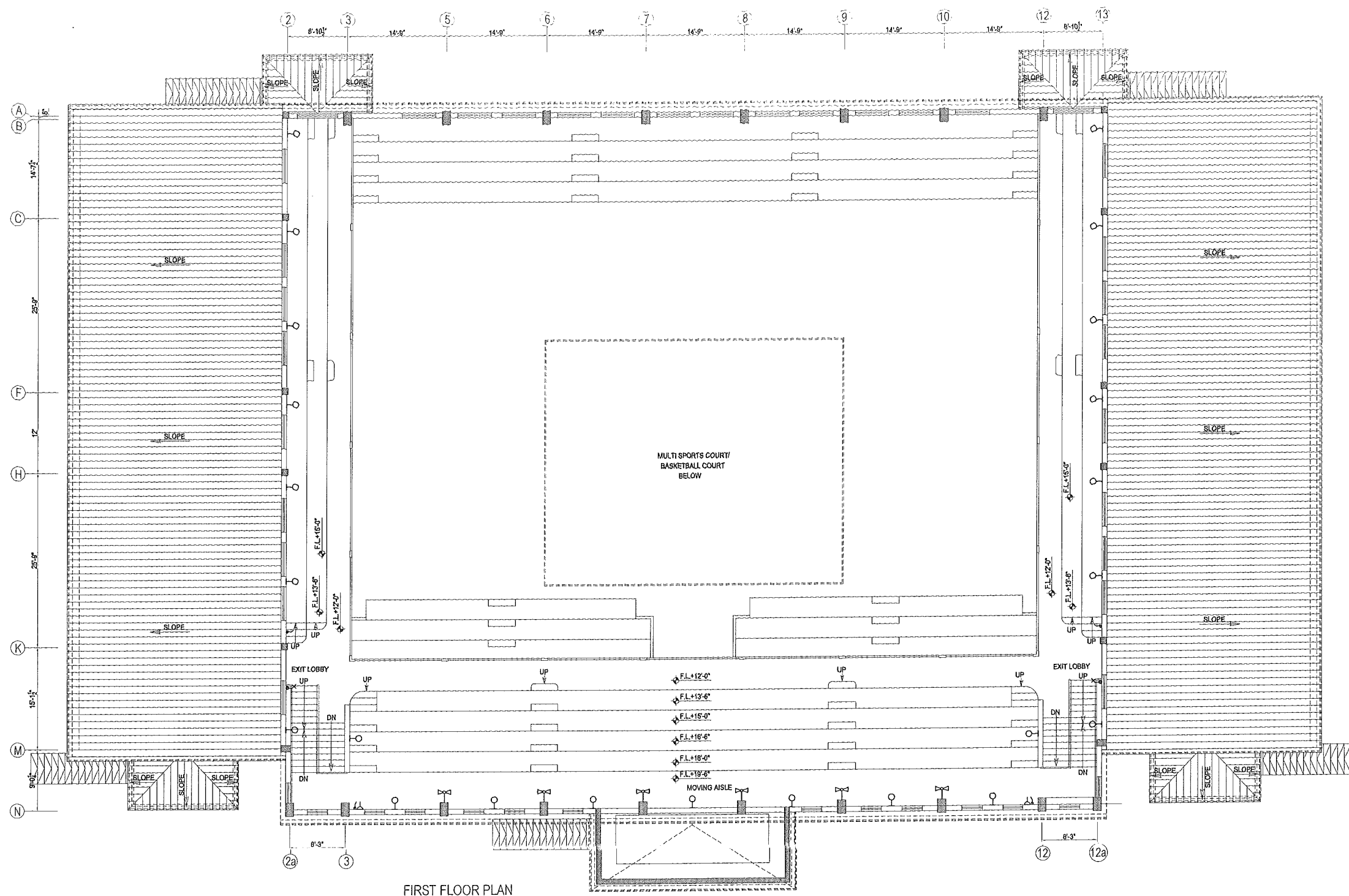
ASSOCIATED CONSULTING ENGINEERS - ACE (PVT) LTD.
Architectural & Town Planning Services, Section
GROUND FLOOR, 36 CIVIC CENTER, M-BLOCK, MODEL TOWN EXTENSION, LAHORE



LEGEND

S.#	Symbol	Description
01	⊙	LED MIRROR LIGHT 1X9 WATTS 2FT
02	⊙	LED DOWN LIGHTER WITH 1X7 WATTS
03	⊙	LED DOWN LIGHTER RECESSED TYPE 1X7 WATTS
04	⊗	LED PANEL LIGHT WITH 4X11 WATTS (2'X2')
05	⊙	LED WALL TYPE LIGHT 1X7 WATTS
06	⊙	LED WEATHER PROOF BULKHEAD LIGHT WITH 1X9 WATTS
07	⊙	FLOOD LIGHT HPI-T 400 WATT
08	⊙	CEILING FAN 60" SWEEP
09	⊙	WALL BRACKET FAN 18" SWEEP
10	⊙	EXHAUST FAN 12" PLASTIC BODY
11	⊙	SWITCH BOARD
12	⊙	TWO WAY SWITCH BOARD
13	⊙	3-PIN 10AMPS. SOCKET OUTLET
14	⊙	3-PIN 20AMPS. SOCKET OUTLET COMBINED 1-SWITCH
15	⊙	TELEPHONE OUTLET RG-11
16	⊙	TELEPHONE JUNCTION BOX (TJB)
17	⊙	DISTRIBUTION BOARD (DB.)
18	⊙	SUB MAIN PANEL BOARD (SMPB.)

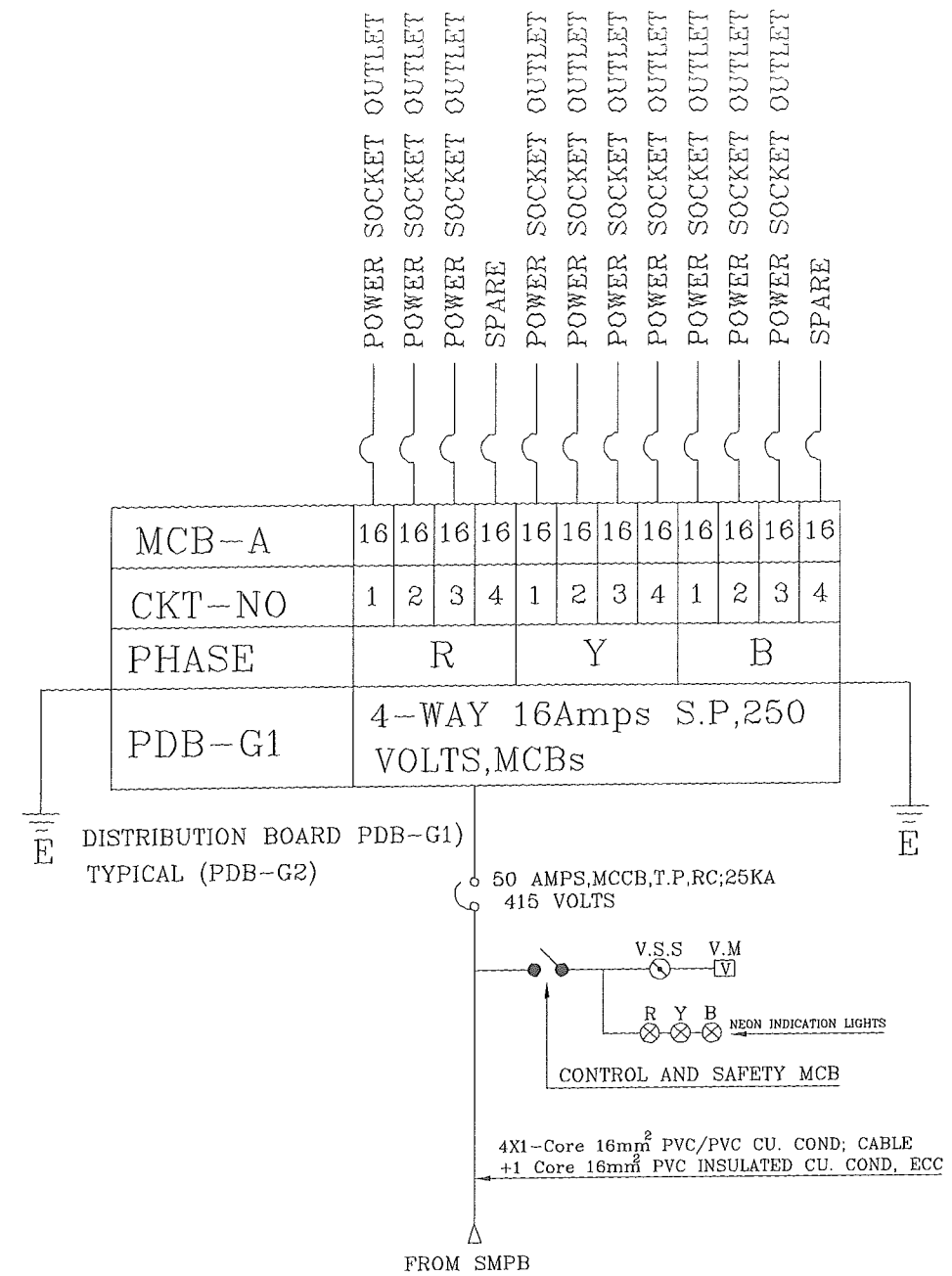
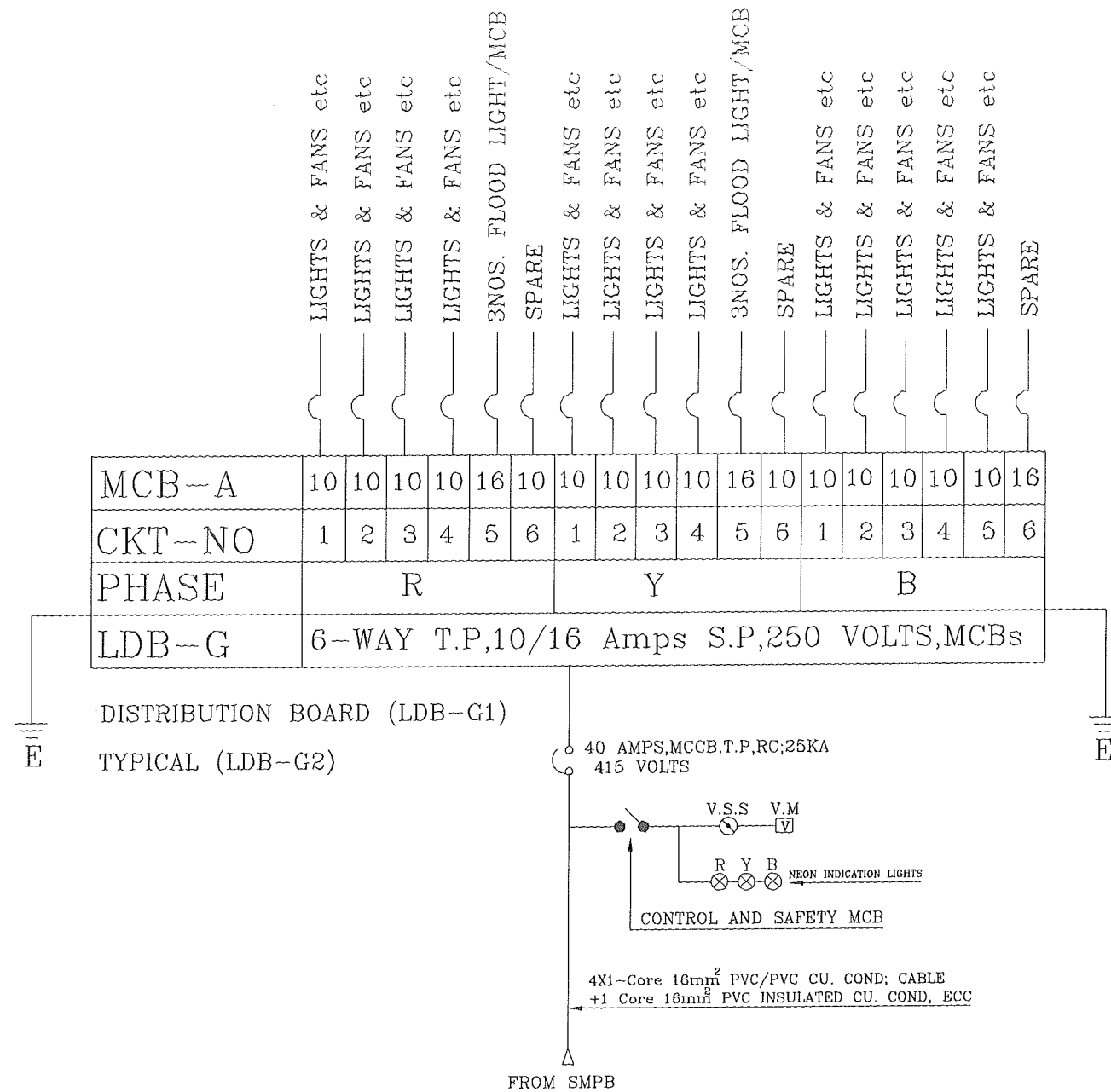
REV.	DATE	DESCRIPTION	DRN.	CHKD.
DRAWN BY:		CONSULTANTS: ASSOCIATED CONSULTING ENGINEERS-ACE (PVT) LTD. Architectural & Town Planning Services, Section Ground Floor, 36 Civic Center, M-Block, Model Town Extension, Lahore		
CHECKED BY:		CLIENT: SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER		
ENGINEER:		PROJECT: MASTER PLANNING ARCHITECTURAL, ENGINEERING DESIGN & CONSTRUCTION SUPERVISION OF UNIVERSITY OF DIR SHERINGAL		
APPROVED BY:		DESCRIPTION: MULTIPURPOSE HALL ELECTRICAL LAYOUT PLAN GROUND FLOOR		
	TYPE:	SCALE:	JOB NO.	ORG NO.
	EE	N.T.S.	6073	SBBU-MPH-EE-01
	DATE:	AUGUST, 2018		



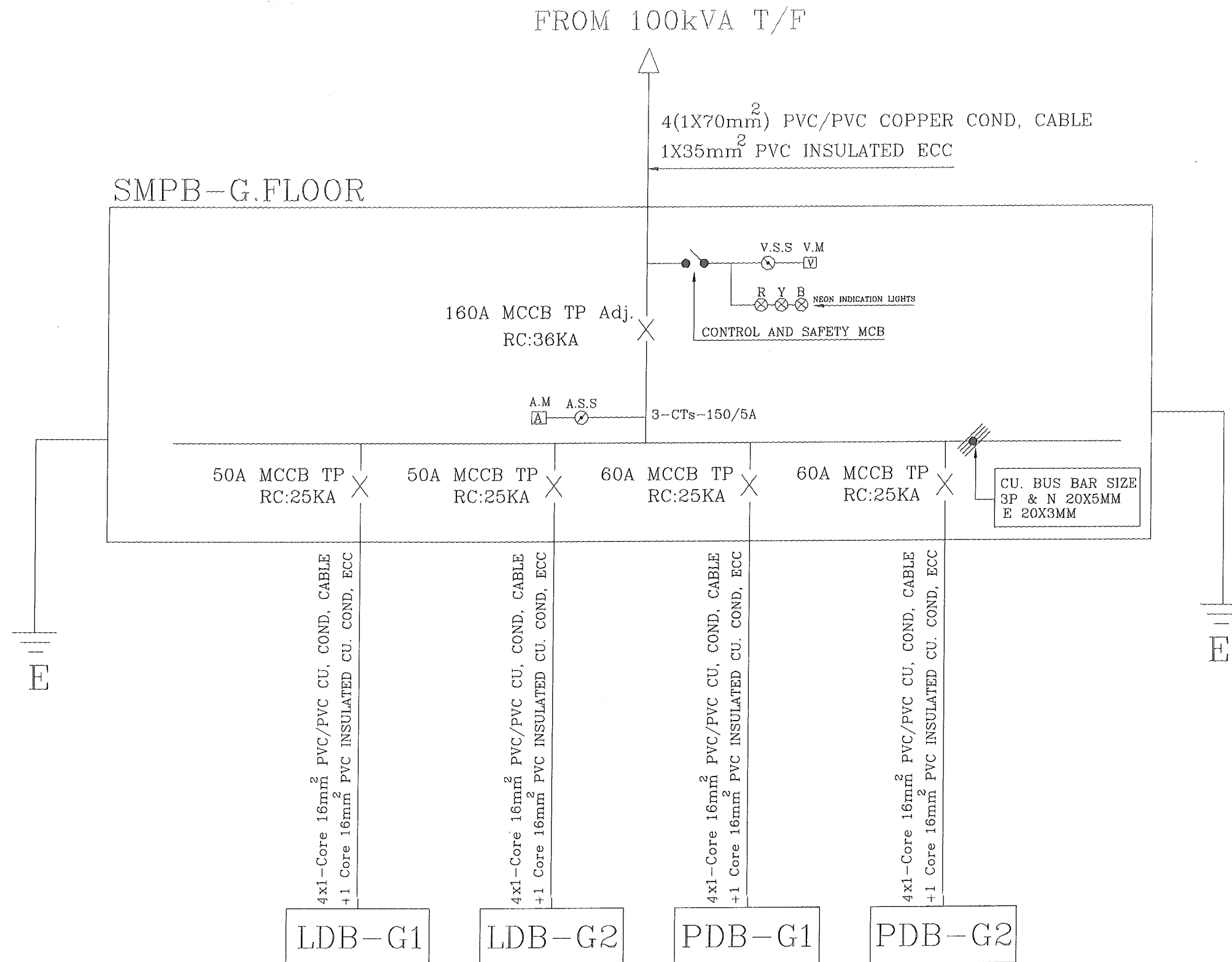
LEGEND

S.#	Symbol	Description
01	LED MIRROR LIGHT 1X9 WATTS 2PT	
02	LED DOWN LIGHTER WITH 1X7 WATTS	
03	LED DOWN LIGHTER RECESSED TYPE 1X7 WATTS	
04	LED PANEL LIGHT WITH 4X11 WATTS (2'X2')	
05	LED WALL TYPE LIGHT 1X7 WATTS	
06	LED WEATHER PROOF BULKHEAD LIGHT WITH 1X9 WATTS	
07	FLOOD LIGHT HPI-T 400 WATT	
08	CEILING FAN 56" SWEEP	
09	WALL BRACKET FAN 18" SWEEP	
10	EXHAUST FAN 12" PLASTIC BODY.	
11	SWITCH BOARD	
12	TWO WAY SWITCH BOARD	
13	3-PIN 10AMPS. SOCKET OUTLET	
14	3-PIN 20AMPS. SOCKET OUTLET COMBINED 1-SWITCH	
15	TELEPHONE OUTLET RG-11	
16	TELEPHONE JUNCTION BOX (TJB)	
17	DISTRIBUTION BOARD (DB.)	
18	SUB MAIN PANEL BOARD (SMPB.)	

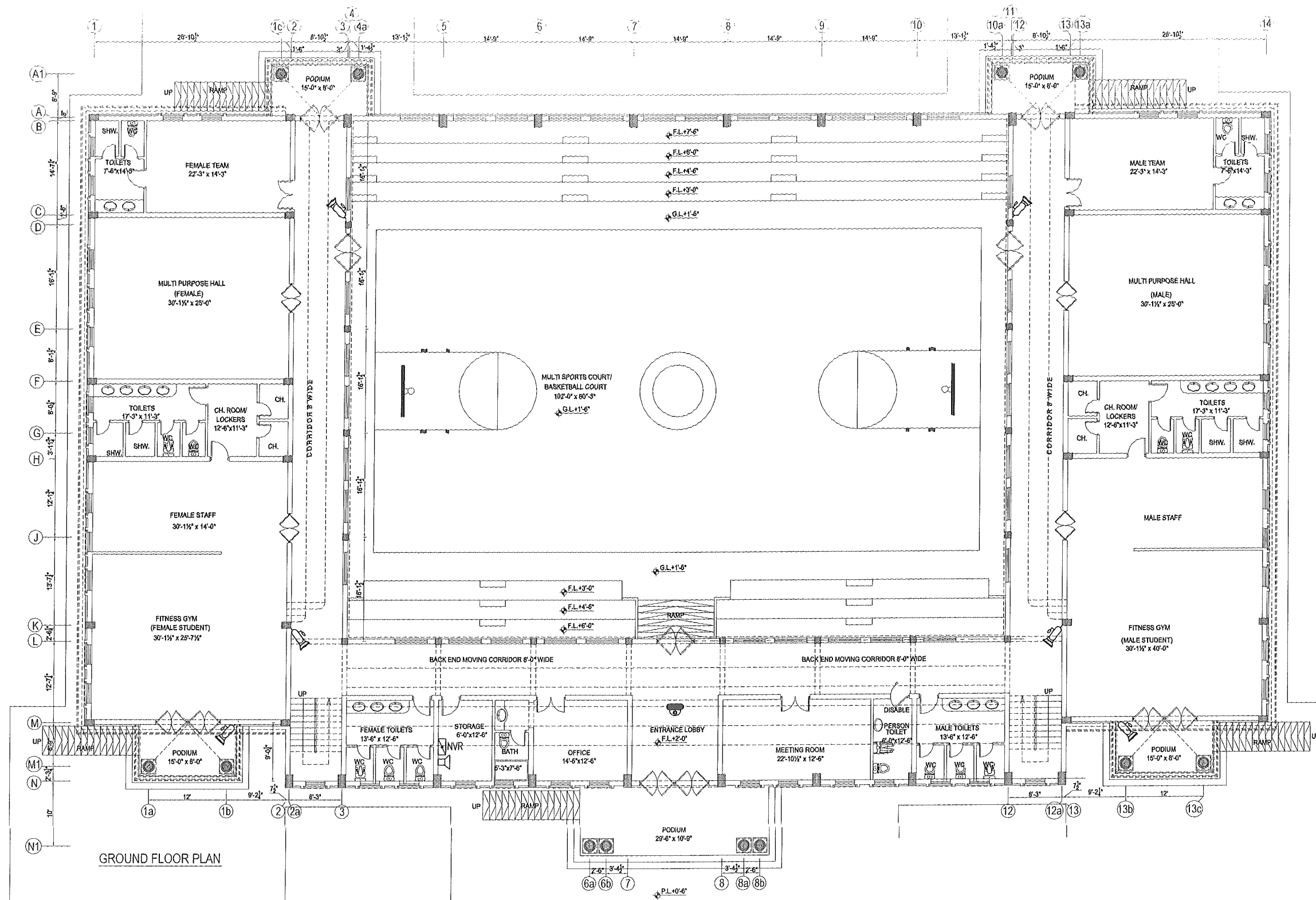
REV.	DATE	DESCRIPTION	DRN.	CHKD.
DRAWN BY:		CONSULTANTS:		
AHSAN ALI		ASSOCIATED CONSULTING ENGINEERS-ACE (PVT) LTD.		
CHECKED BY:		Architectural & Town Planning Services, Section		
M.R. NAYYAR		Ground Floor, 36 Civic Center, M-Block,		
ENGINEER:		Model Town Extension, Lahore		
CLAUDETIA SHAH		CLIENT:		
APPROVED BY:		SHAHED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DR UPPER		
KHALID NAWAZ		PROJECT:		
		MASTER PLANNING ARCHITECTURAL, ENGINEERING		
		DESIGN & CONSTRUCTION SUPERVISION OF		
		UNIVERSITY OF DR SHERINGAL		
		DESCRIPTION:		
		MULTIPURPOSE HALL		
		ELECTRICAL LAYOUT PLAN		
		GROUND FLOOR		
	TYPE:	SCALE:	JOB NO.	DRG NO.
	EE	N.T.S.	6073	SBBU-MPH-EE-02
	DATE:	AUGUST, 2018		



REV.	DATE	DESCRIPTION	DRN.	CHKD.
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REV.	DATE	DESCRIPTION	DRN.	CHKD.
DRAWN BY:		CONSULTANTS ASSOCIATED CONSULTING ENGINEERS-ACE (PVT) LTD. Architectural & Town Planning Services, Section Ground Floor, 36 Civic Center, M-Block, Model Town Extension, Lahore		
CHECKED BY:		CLIENT: SHAMHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER		
ENGINEER:		PROJECT: MASTER PLANNING ARCHITECTURAL, ENGINEERING DESIGN & CONSTRUCTION SUPERVISION OF UNIVERSITY OF DIR SHERINGAL		
APPROVED BY:		DESCRIPTION: MULTIPURPOSE HALL SINGLE LINE DIAGRAM FOR SUB MAIN PANEL BOARD		
		TYPE: N.T.S.	JOB NO.	DRG NO.
		DATE: AUGUST: 2018	b073	SBBU-MPH-EE-04

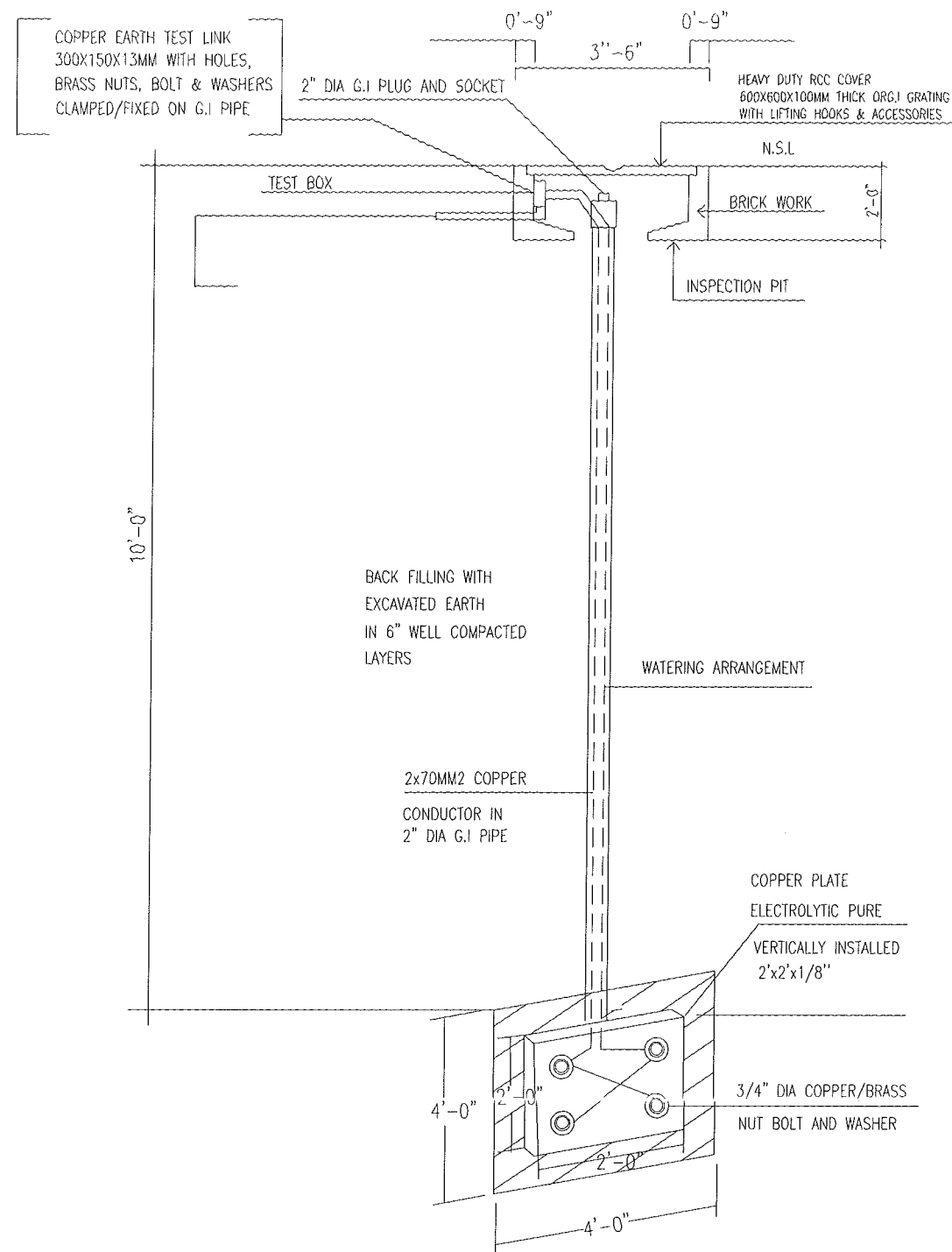


LEGEND

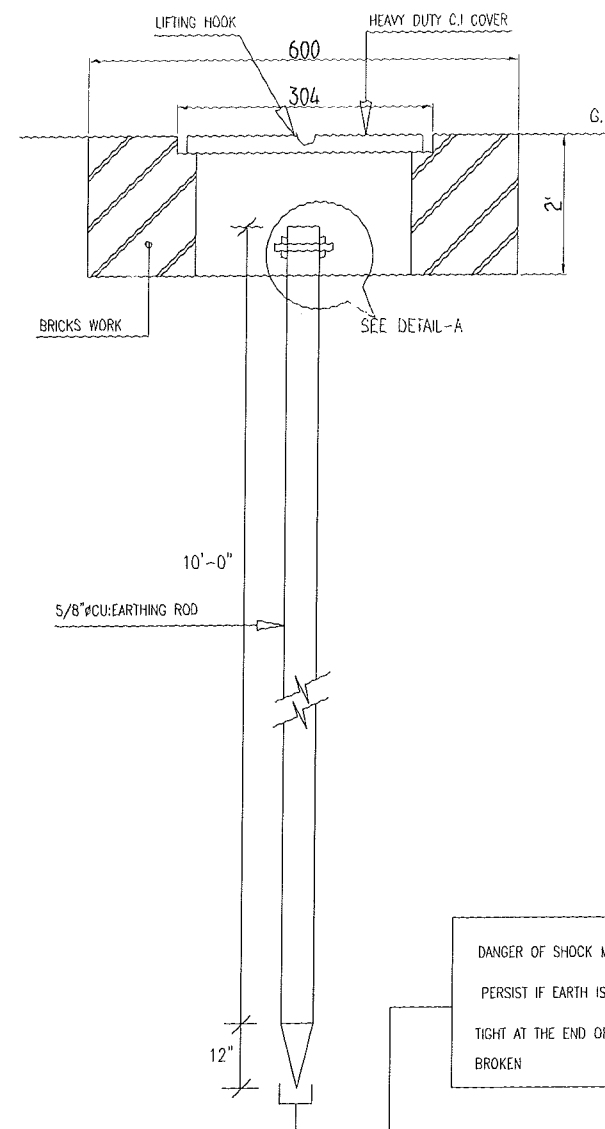
SR.NO.	SYMBOLS	DESCRIPTION
1		IP DOME CAMERA
2		INDOOR POE IP PTZ CAMERA
3		OUTDOOR POE IP PTZ CAMERA
4		BULLET CAMERA OUTDOOR
5		NETWORKING VIDEO RECORDER (NVR)
6		42" LED SCREEN

REV.	DATE	DESCRIPTION	DRN.	CHKD.
DRAWN BY:		CONSULTANTS: ASSOCIATED CONSULTING ENGINEERS-ACE (PVT) LTD. Architectural & Town Planning Services, Section Ground Floor, 36 Civic Center, M-Block, Model Town Extension, Lahore		
CHECKED BY:		CLIENT: SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINAGAL, DIR UPPER		
ENGINEER:		PROJECT: MASTER PLANNING ARCHITECTURAL, ENGINEERING DESIGN & CONSTRUCTION SUPERVISION OF UNIVERSITY OF DIR SHERINAGAL		
APPROVED BY:		DESCRIPTION: MULTIPURPOSE HALL CCTV SYSTEM LAYOUT PLAN GROUND FLOOR		
	TYPE:	SCALE: N.T.S.	JOB NO.	DRG NO.
	EE	DATE: AUGUST, 2018	6073	SBBU-MPH-EE-05

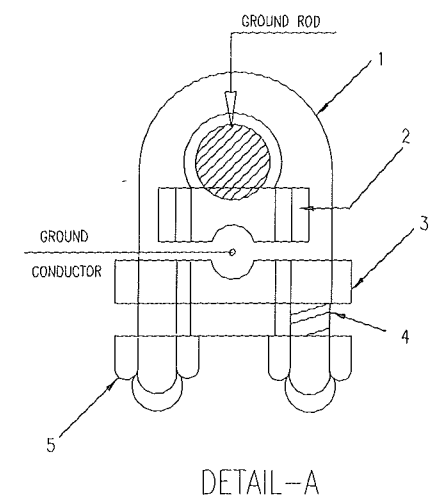
EARTHING ELECTRODE (PLATE TYPE)



EARTHING ELECTRODE (ROD TYPE)



ITEM	NAME	MATERIAL
1	U-BOLT	MILD STEEL
2	SPACER	CAST IRON
3	BASE	MILD STEEL
4	SPRING WASHER	CARBON STEEL
5	NUT	MILD STEEL



DANGER OF SHOCK MAY
PERSIST IF EARTH IS NOT
TIGHT AT THE END OR
BROKEN

REV.	DATE	DESCRIPTION	DRN.	CHKD.
DRAWN BY:		CONSULTANTS: ASSOCIATED CONSULTING ENGINEERS-ACE (PVT) LTD. Architectural & Town Planning Services, Section Ground Floor, 36 Civic Center, M-Block, Model Town Extension, Lahore		
CHECKED BY:		CLIENT: SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER		
ENGINEER:		PROJECT: MASTER PLANNING ARCHITECTURAL ENGINEERING DESIGN & CONSTRUCTION SUPERVISION OF UNIVERSITY OF DIR SHERINGAL		
APPROVED BY:		DESCRIPTION: MULTIPURPOSE HALL DETAIL OF EARTHING ARRANGEMENT		
	TYPE:	SCALE: N.T.S.	JOB NO:	ORG NO:
	EE	DATE: AUGUST, 2018	6073	SBBU-MPH-EE-06

TENDER DRAWINGS FOR MULTIPURPOSE HALL DEVELOPMENT OF UNIVERSITY OF DIR, SHRINGAL, DIR UPPER

SR. NO.	DESCRIPTION	DRG. NO.
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PUBLIC HEALTH

WATER SUPPLY SYSTEM		
1	(GROUND FLOOR PLAN) EXTERNAL WATER SUPPLY SYSTEM	SBBU-MPH-WS-01
2	(GROUND FLOOR PLAN)WATER SUPPLY SYSTEM/TOILETS DETAIL	SBBU-MPH-WS-02

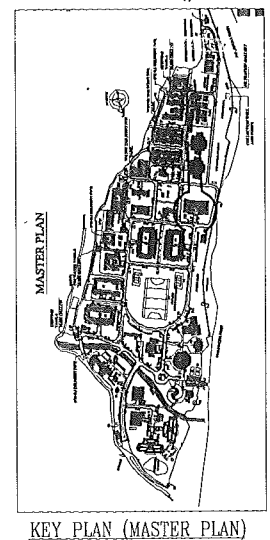
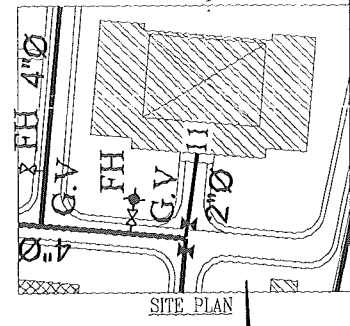
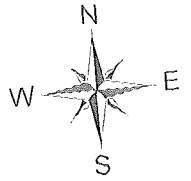
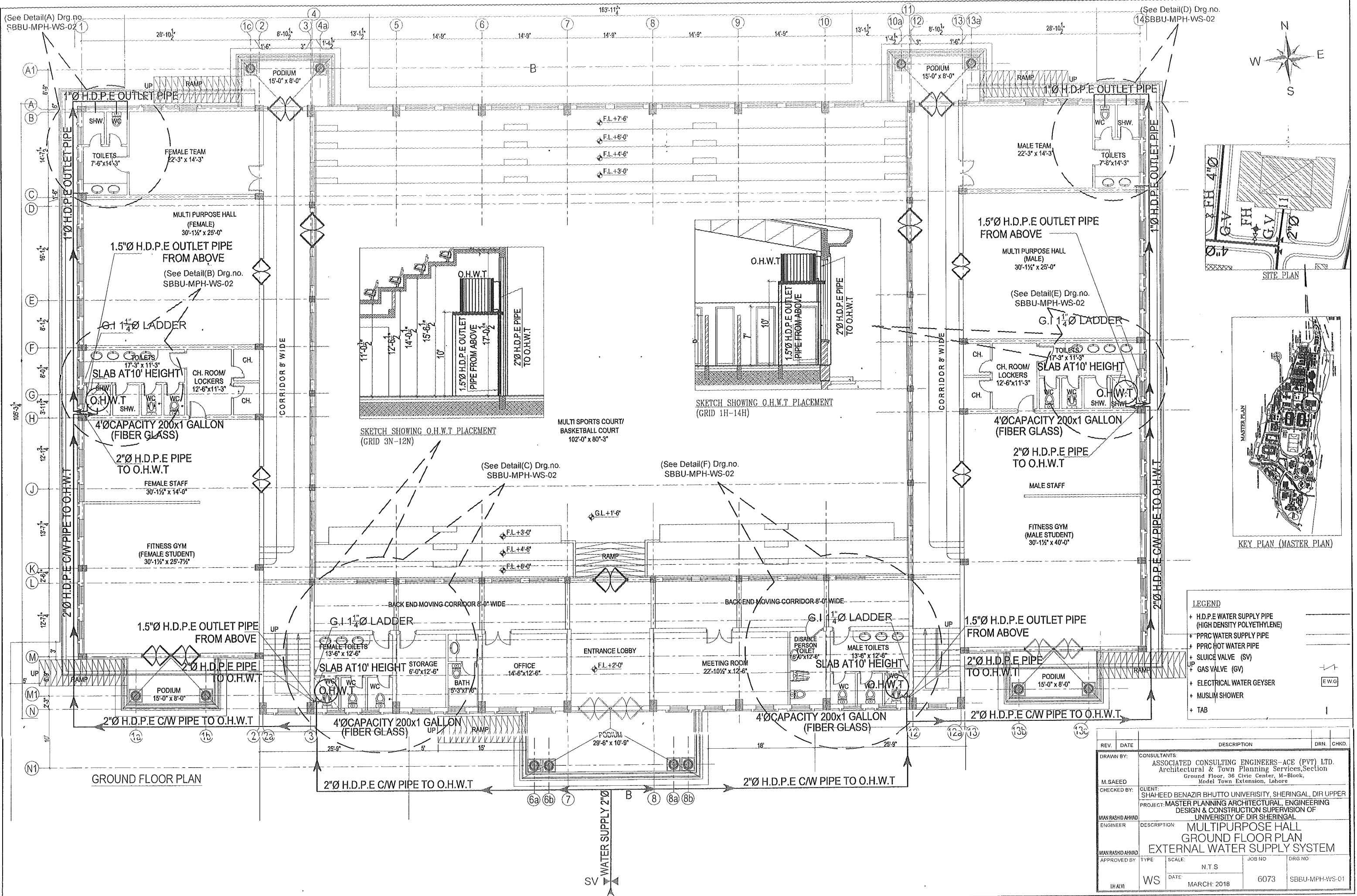
PUBLIC HEALTH

SEWERAGE SYSTEM		
3	(GROUND FLOOR PLAN) EXTERNAL SEWERAGE SYSTEM	SBBU-MPH-SW-03
4	(GROUND FLOOR PLAN) SEWERAGE SYSTEM	SBBU-MPH-SW-04
5	(GROUND FLOOR PLAN) SEWERAGE SYSTEM/TOILETS DETAIL	SBBU-MPH-SW-05

SEPTEMBER 2018
CONSULTANTS

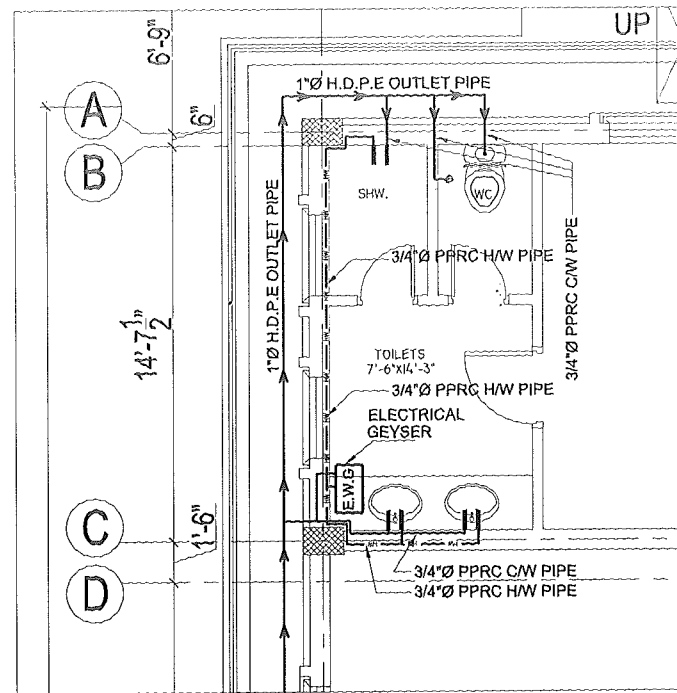


ASSOCIATED CONSULTING ENGINEERS ACE (PVT) LTD
Architectural & Town Planning Services Section
GROUND FLOOR, 36-CIVIC CENTRE, M-BLOCK MODEL TOWN EXT.

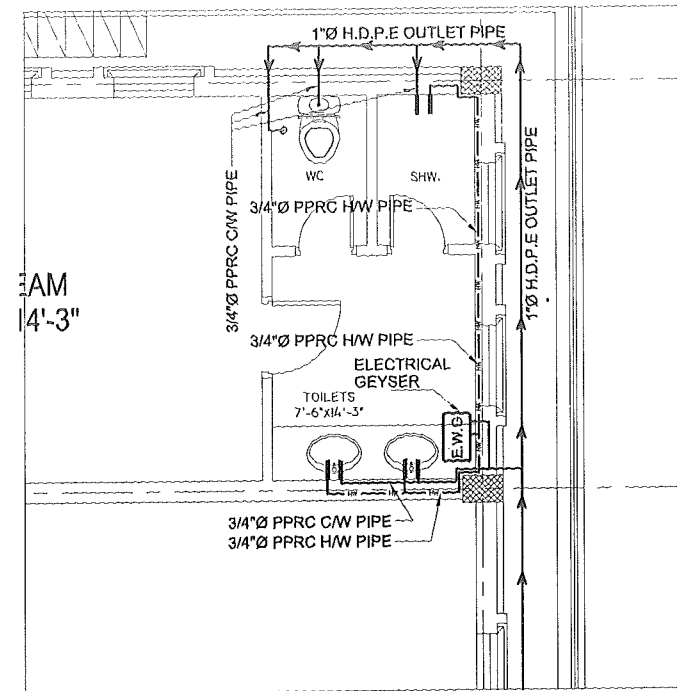


- LEGEND**
- + H.D.P.E WATER SUPPLY PIPE (HIGH DENSITY POLYETHYLENE)
 - + PPRC WATER SUPPLY PIPE
 - + PPRC HOT WATER PIPE
 - + SLUICE VALVE (SV)
 - + GAS VALVE (GV)
 - + ELECTRICAL WATER GEYSER
 - + MUSLIM SHOWER
 - + TAB

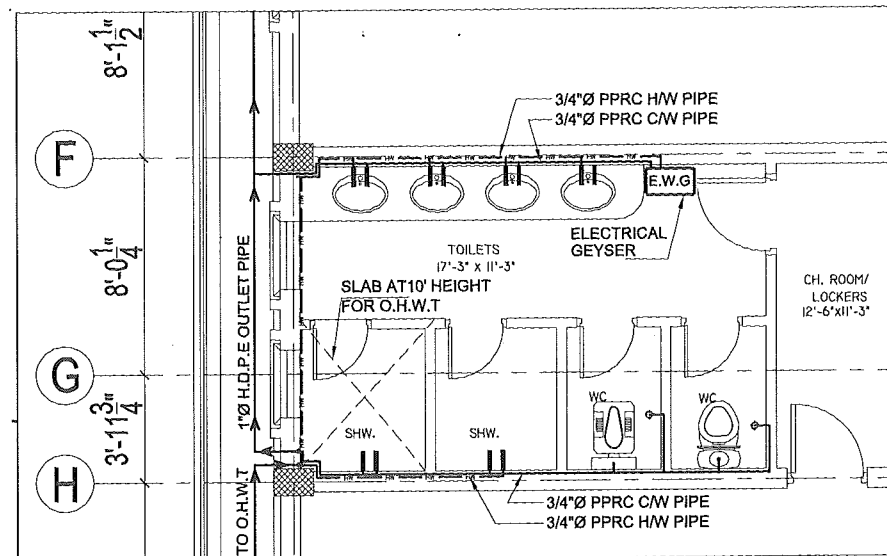
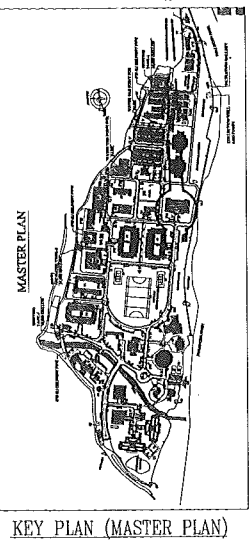
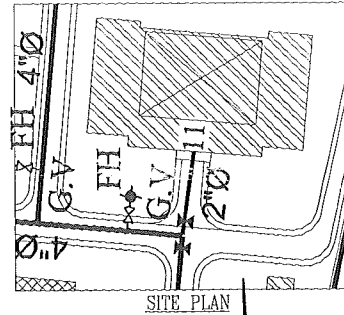
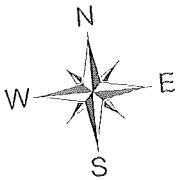
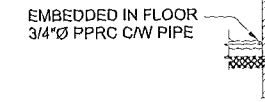
REV.	DATE	DESCRIPTION	DRN.	CHKD.
DRAWN BY:	CONSULTANTS: ASSOCIATED CONSULTING ENGINEERS-ACE (PVT) LTD. Architectural & Town Planning Services, Section Ground Floor, 36 Civic Center, M-Block, Model Town Extension, Lahore			
M. SAEED	CLIENT: SHAHJEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER			
CHECKED BY:	PROJECT: MASTER PLANNING ARCHITECTURAL, ENGINEERING DESIGN & CONSTRUCTION SUPERVISION OF UNIVERSITY OF DIR SHERINGAL			
MANRASHID AHMAD	DESCRIPTION: MULTIPURPOSE HALL GROUND FLOOR PLAN EXTERNAL WATER SUPPLY SYSTEM			
ENGINEER	TYPE	SCALE:	JOB NO.	DRG NO.
MANRASHID AHMAD	WS	N.T.S	6073	SBBU-MPH-WS-01
APPROVED BY:	DATE:			
IHALVI	MARCH, 2018			



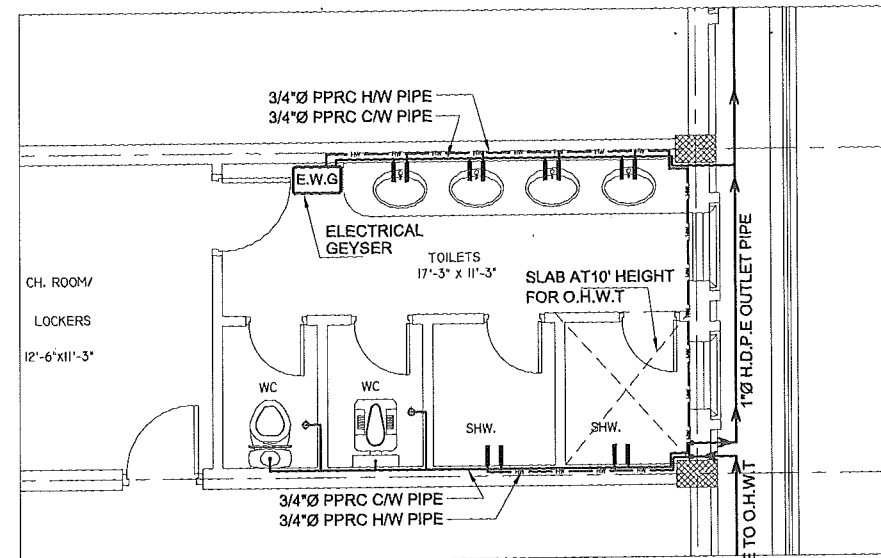
DETAIL A



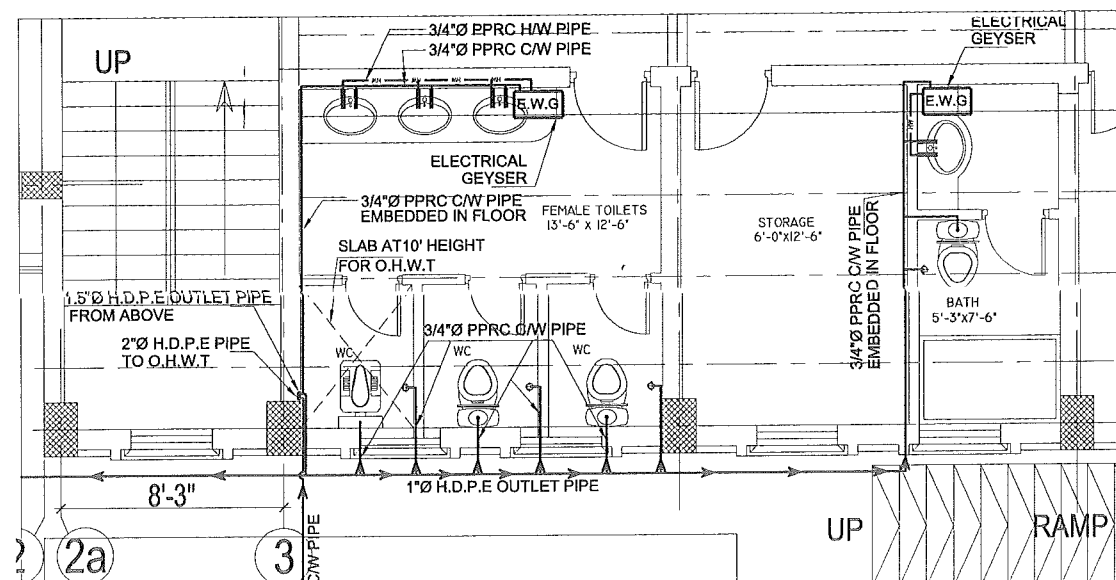
DETAIL D



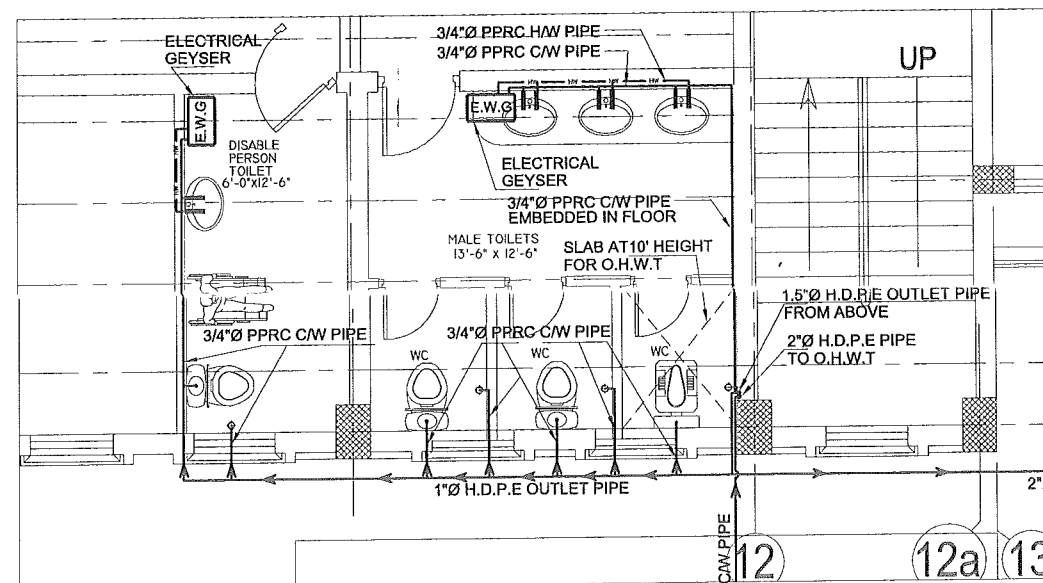
DETAIL B



DETAIL E



DETAIL C



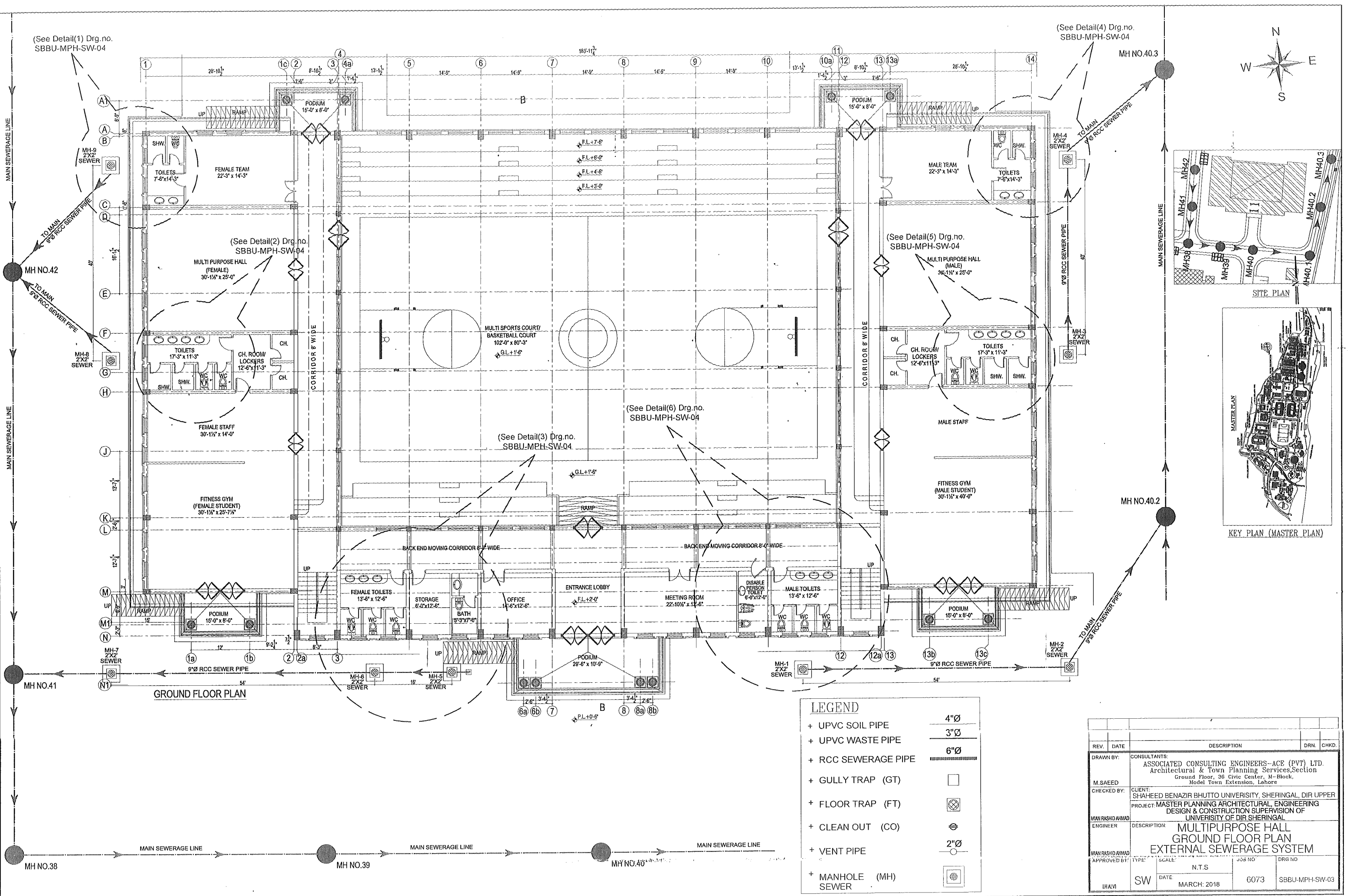
DETAIL F

LEGEND

- + H.D.P.E. WATER SUPPLY PIPE (HIGH DENSITY POLYETHYLENE)
- + PPRC WATER SUPPLY PIPE
- + PPRC HOT WATER PIPE
- + SLUICE VALVE (SV)
- + GAS VALVE (GV)
- + ELECTRICAL WATER GEYSER
- + MUSLIM SHOWER
- + TAB

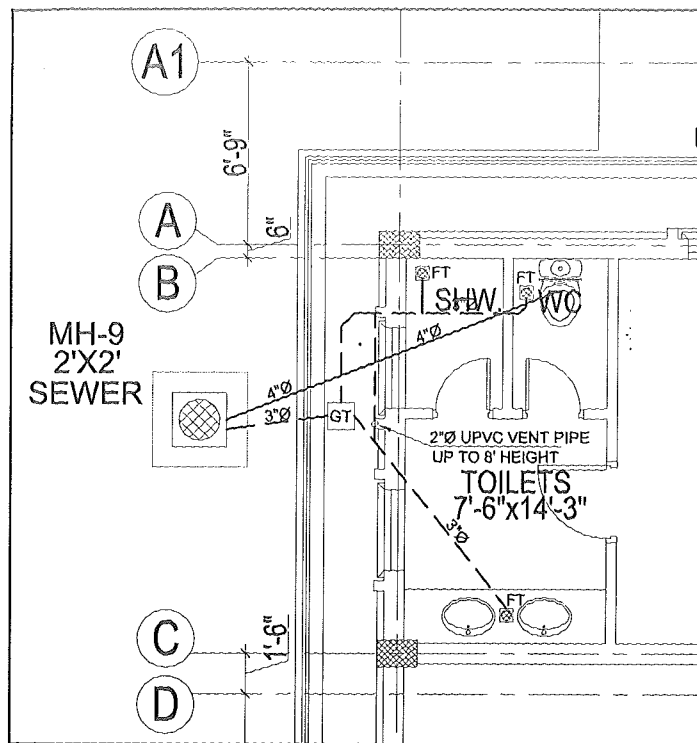


REV.	DATE	DESCRIPTION		DRN. CHKD.
DRAWN BY:		CONSULTANTS: ASSOCIATED CONSULTING ENGINEERS-ACE (PVT) LTD. Architectural & Town Planning Services, Section Ground Floor, 36 Civic Center, M-Block, Model Town Extension, Lahore		
M. SAEED				
CHECKED BY:		CLIENT: SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER		
		PROJECT: MASTER PLANNING ARCHITECTURAL, ENGINEERING DESIGN & CONSTRUCTION SUPERVISION OF UNIVERSITY OF DIR SHERINGAL		
MUHAMMAD RASHID AHMAD ENGINEER		DESCRIPTION: MULTIPURPOSE HALL GROUND FLOOR PLAN WATER SUPPLY SYSTEM / TOILETS DETAIL		
MUHAMMAD RASHID AHMAD				
APPROVED BY:	TYPE:	SCALE:	JOB NO.	DRG NO.
		N T S		
	WS	DATE	6073	SSBU-MPH-WS-02
	IMA/M	MARCH: 2018		

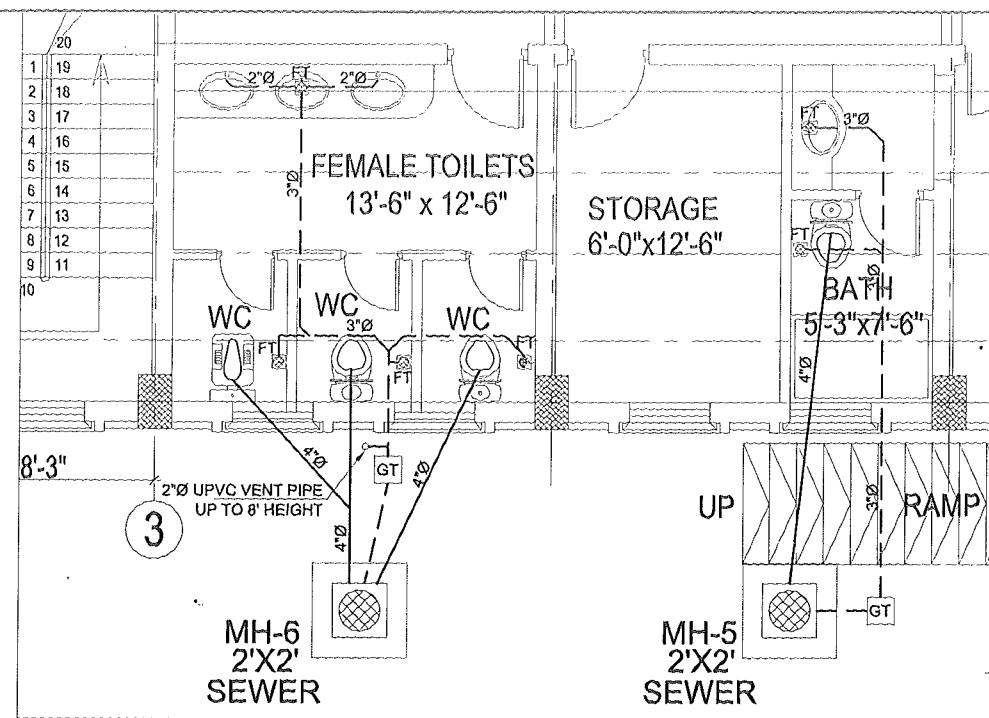


LEGEND	
+ UPVC SOIL PIPE	4"Ø
+ UPVC WASTE PIPE	3"Ø
+ RCC SEWERAGE PIPE	6"Ø
+ GULLY TRAP (GT)	
+ FLOOR TRAP (FT)	
+ CLEAN OUT (CO)	
+ VENT PIPE	2"Ø
+ MANHOLE (MH) SEWER	

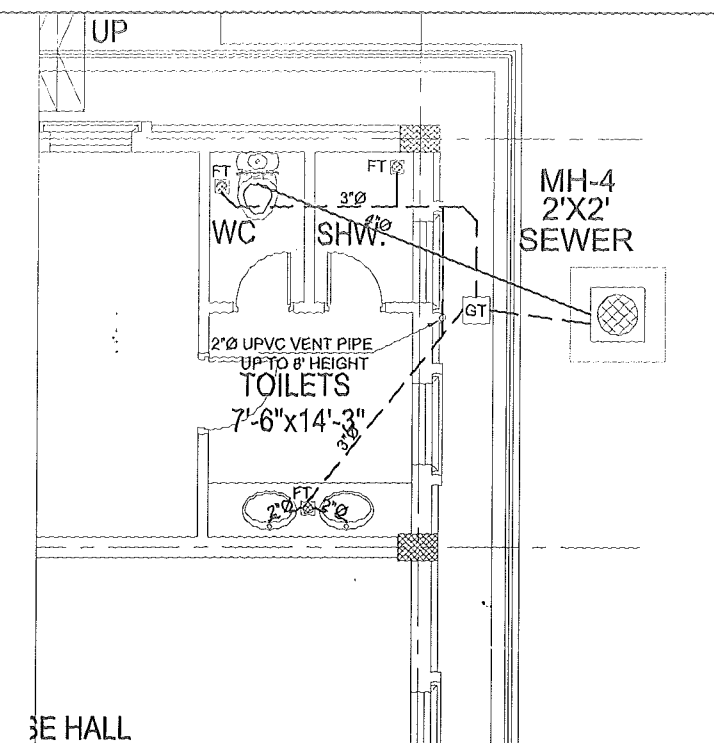
REV.	DATE	DESCRIPTION	DRN.	CHKD.
DRAWN BY: CONSULTANTS: ASSOCIATED CONSULTING ENGINEERS-ACE (PVT) LTD. Architectural & Town Planning Services, Section Ground Floor, 36 Civic Center, M-Block, Model Town Extension, Lahore				
M.SAEED CHECKED BY: CLIENT: SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER				
PROJECT: MASTER PLANNING ARCHITECTURAL, ENGINEERING DESIGN & CONSTRUCTION SUPERVISION OF UNIVERSITY OF DIR, SHERINGAL				
MAN RASHID AHMAD ENGINEER DESCRIPTION: MULTIPURPOSE HALL GROUND FLOOR PLAN EXTERNAL SEWERAGE SYSTEM				
MAN RASHID AHMAD APPROVED BY: TYPE: SW		SCALE: N.T.S.	JOB NO: 6073	DRG NO: SBBU-MPH-SW-03
DATE: MARCH, 2018				



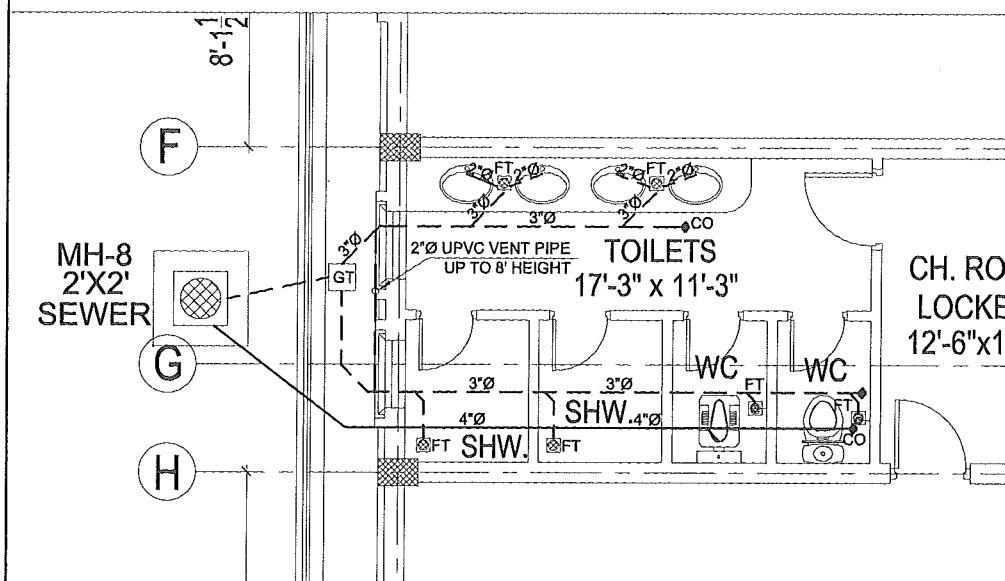
DETAIL 1,



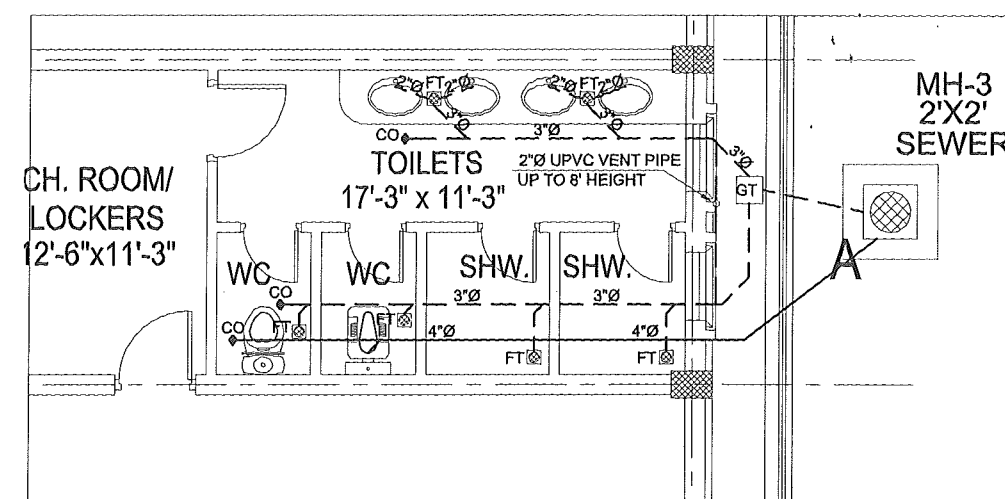
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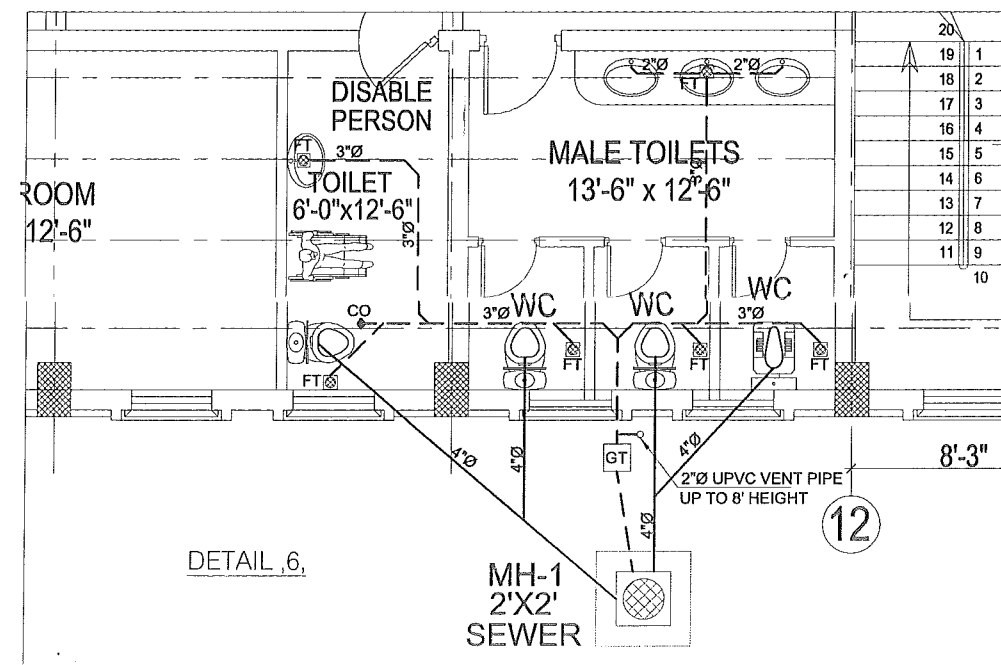
DETAIL 4,



DETAIL 2,



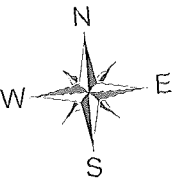
DETAIL 5,



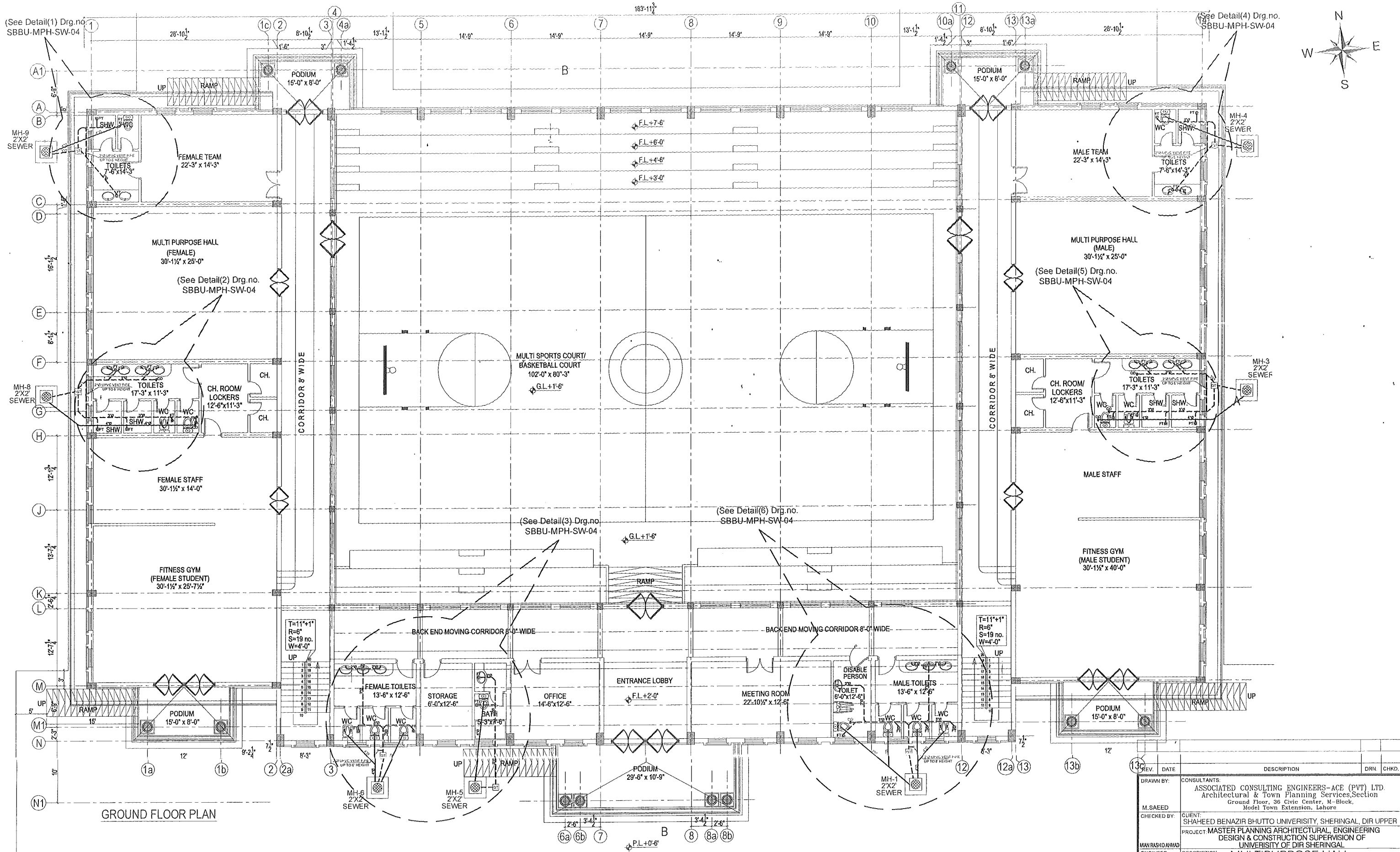
DETAIL 6,

LEGEND

+ UPVC SOIL PIPE	4"Ø
+ UPVC WASTE PIPE	3"Ø
+ RCC SEWERAGE PIPE	6"Ø
+ GULLY TRAP (GT)	□
+ FLOOR TRAP (FT)	⊗
+ CLEAN OUT (CO)	⊕
+ VENT PIPE	2"Ø
+ MANHOLE (MH) SEWER	⊙



REV.	DATE	DESCRIPTION	DRN.	CHKD.
DRAWN BY:	M.SAEED	CONSULTANTS: ASSOCIATED CONSULTING ENGINEERS-ACE (PVT) LTD. Architectural & Town Planning Services, Section Ground Floor, 36 Civic Center, M-Block, Model Town Extension, Lahore		
CHECKED BY:	MAN RASHID AHMAD	CLIENT: SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER PROJECT: MASTER PLANNING ARCHITECTURAL, ENGINEERING DESIGN & CONSTRUCTION SUPERVISION OF UNIVERSITY OF DIR SHERINGAL		
ENGINEER	MAN RASHID AHMAD	DESCRIPTION: MULTIPURPOSE HALL GROUND FLOOR PLAN SEWERAGE SYSTEM / TOILETS DETAIL		
APPROVED BY:	IHALVI	TYPE: SW	SCALE: N.T.S	JOB NO: 6073
		DATE: MARCH 2018		DRG NO: SBBU-MPH-SW-04



GROUND FLOOR PLAN

REV.	DATE	DESCRIPTION	DRN.	CHKD.
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DRAWN BY:	CONSULTANTS:
M.SAEED	ASSOCIATED CONSULTING ENGINEERS-ACE (PVT) LTD.
CHECKED BY:	Architectural & Town Planning Services, Section
MANRASHID AHMAD	Ground Floor, 36 Civic Center, M-Block,
ENGINEER	Model Town Extension, Lahore
APPROVED BY:	CLIENT:
IHALM	SHAHEED BENAZIR BHUTTO UNIVERSITY, SHERINGAL, DIR UPPER
TYPE:	PROJECT: MASTER PLANNING ARCHITECTURAL, ENGINEERING
SCALE:	DESIGN & CONSTRUCTION SUPERVISION OF
N.T.S.	UNIVERSITY OF DIR SHERINGAL
JOB NO:	DESCRIPTION:
6073	MULTIPURPOSE HALL
DATE:	GROUND FLOOR PLAN
MARCH: 2018	SEWERAGE SYSTEM
DRG NO:	
SBBU-MPH-SW-05	